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The Practical Teacher's Art Monthly

July 1909

THOMAS NELSON & SONS LONDON
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VOL. XXX No. I

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Vol. XXX. No. 1. JULY, 1909. Price 6d.

Notices to Correspondents and Subscribers.

"The Practical Teacher" may be ordered of any Newsagent or Bookseller, or at any Bookstall, in the United Kingdom or in the Colonies. Supplies are sent monthly to the chief towns in Australasia, South Africa, and India.

London Office: 35 and 36 Paternoster Row.
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Subscribers may obtain "The Practical Teacher," post free, from the Publishers at the following terms:—

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All literary communications should be addressed to the Editor, Office of "The Practical Teacher," 35 and 36 Paternoster Row, London, E.C.

Remittances, Cheques, Post-Office Orders, etc., should be made payable to Thomas Nelson and Sons. Advertisement rates on application.

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Educational Opinion.

A REPORT which gives much food for thought is the report of the Medical Officer (for Education) of the London County Council for the twenty-one months ending with last December. It is much too long for us to give a detailed analysis of it, but so much ground is traversed, and the life of London is touched at so many points, that we may have to return to it from time to time. It is not altogether pleasant reading—medical reports seldom are—but it is invaluable in showing the dire necessity for inspection, the progress already made, and the lines on which the cure or prevention of the conditions found should proceed. For the person who is apathetic about intervention in social and personal hygiene, or interference with the control of the children and youth of the nation, we can imagine no better exercise than the reading of such a report. It would act as an effectual dispeller of all illusions as to the conditions under which the bulk of the children of the country are being born and bred. The brief and pointed introduction to the report drives home a very necessary thing—the definition of the duties of an educational authority, and the clear statement of its limitations. There is, as the report indicates, too much overlapping of authorities, and a consequent lack of co-ordination and efficiency, to say nothing of increased cost and the danger of friction.

A Notable Report.

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THE suggestion that all "public provision for protecting and aiding growth and development of children during the years of school life—three to sixteen years of age—should be entirely committed to the educational authority," seems a reasonable one, and one that would simplify matters considerably. It would bring children—*qua* children—to be taught, fed, protected, under one authority charged with this great public care, and leave them, as a part of the social fabric, in other respects amenable to the ordinary authorities. One thing is pretty certain—such a unification and simplification would bring about a considerable economy in the administrative functions connected with the public care of children. To an educationist one of the most interesting parts of the report is the section on "medical treatment." It will be remembered that when medical inspection of schools was instituted, it was hinted that further development in the way of school clinics or some other form of provision for medical treatment might be found necessary. Dr Kerr's report is an illuminating comment on that hint, and the analysis of the report of a special sub-committee on the question is of first-class importance to educationists of every type.

Duties of the Educational Authority.

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WHAT happens in London happens presumably, in some degree, in all other places. When "it can be shown in full detail that the health of many children is impaired, temporarily or permanently, for want of medical treatment," that in many cases this is "practically unattainable," and that the hospitals are already seriously overburdened by even the small proportion of cases in which advice is sought, in face of this it is not difficult to see that the question of special provision, by school clinics or otherwise, is becoming acute. It is most urgently needed in matters affecting eyes, ears, teeth, general debility, and tuberculosis and ringworm. It is startling to read that the loss in grant through this obnoxious disease from effect on attendance is some £5,654 per annum in London. That is bringing the necessity for treatment home with a vengeance. Teeth and eyes are in a bad way in the London schools. Sixty thousand is given as the number of children suffering from defective vision; teeth are so unsatisfactory that numbers are not given; and at least one per cent., or 7,500 cases, is given as the proportion of ear trouble. It is disquieting reading. That part of the British Empire which is found in the schools of London rests apparently on an insecure foundation of defective vision, carious teeth, and damaged ears, with other defects thrown in. Truly medical inspection was instituted none too soon!

Medical Treatment.

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HOW medical inspection may affect the internal organisation of the work of a school is seen in the report of an investigation on the teaching of needlework to young children. Actual results are given, and the influence of the implements, materials, and colours used is discussed, and some practical suggestions founded on the results of the observations of the medical officers are made. It is increasingly evident from this report that the teacher will have to work hand-in-hand with the medical officer—will, in fact, have to be his *aide-de-camp*—if the best, or indeed any, permanent benefits are to be obtained. Speaking of benefits brings up an impressive photograph inserted in the section dealing with open-air schools. It is a double picture of some children, taken one month and four months after their reception in one of London's open-air schools. If nothing else existed, this would be a striking proof of the inestimable benefit which the nation may derive from the adequate medical inspection of school children when followed by remedial treatment.

Doctor and Teacher.

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CURIOUSLY enough, the last issue of the *American Physical Education Review* contains an admirable article by Dr. Maxwell, the New York superintendent, on this very question of medical inspection, which reinforces some of the points we have drawn from Dr. Kerr's report. On the question of unifying the authorities the article is plump: "Dual authority and responsibility in a school—that of the school authorities and that of the health authorities—always has resulted, and always will result, in confusion and inefficiency." Equally downright is Dr. Maxwell on the school doctor: "Experts are required, and experts in school work are not developed by health authorities." That is perfectly true. For this work men and women are wanted who will give themselves to it, and by experience train themselves into expert knowledge. Dr. Maxwell gives some extraordinary figures showing the results arrived at by "young men just out of college,

Confirmation from New York.

sent by Boards of Health into our schools to examine children." The discrepancies are almost farcical in their grossness, and add point to his demand for experts to do the work. On the question of medical treatment his article re-echoes the report of the London officer.

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Revolutions.

"BARRING-OUT," as a schoolboy, freakish way of expressing dissatisfaction with one's teachers, we have known; but in America the university students seem to be fertile in finding ways of expressing themselves. If the *Journal of Education* is to be believed, a sort of wave of rebellion has been sweeping over the universities, manifesting itself in some queer outbreaks. In Minnesota two hundred engineering students struck for a week's holiday; in New England, "five miles from Boston," the students posted a sarcastic "Faculty Roll Call" in the college grounds, containing uncomplimentary descriptions of the teaching staff. In Chicago, disliking a rule concerning physical exercise, they struck in a body. In Illinois University the women students refused to dance round the maypole because (O feminine reason!) they didn't like the dancing-master! And in Texas a professor who rejoiced in long whiskers was waylaid in the evening in the grounds, and forcibly despoiled of his hirsute appendages! The American student is evidently a very lively creature, who believes in "self-expression" at whatever cost—to others.

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Babel.

WE mentioned some time ago the mixture of nationalities which peoples Chicago. It must indeed be a Babel, if the return made by the head of one of the elementary schools there is correct. His school contains 1,200 pupils, divided among *twenty-six nationalities.* These include, besides representatives of the more customary European nations, Slavs and Persians. Imagination boggles at the task of the teachers in that particular Noah's ark of a school. Yet such is the influence of school life that the head teacher maintains that, while entering school as twenty-six distinct classes of humanity, the pupils leave it as one race—American. It has often been said that whatever differences separated the men who have made America their home, in one generation they all disappeared, and the population became homogeneous in type—American pure and simple. It is claimed that this metamorphosis is due to the primary schools of the country. If it be so, no greater testimony to the effective influence of elementary school teachers was ever uttered.

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Circular 705

ANOTHER Memorandum from the Board of Education!—this time on "Language Teaching in State-aided Secondary Schools in England." We read it in the hope of finding therein the condensed wisdom of the Board of Education and its inspectors and advisers in the matter of the teaching of languages. Our experience was that of the reader of the account of Iceland. Chapter XXV. was on "Snakes in Iceland." Turning to the chapter, he found "There are none" as the succinct account of Icelandic ophidians. At the same time we cannot say that we have derived nothing from the perusal of Circular 705. It consists of two parts, the first being an instance of rare self-depreciation; for it really sets forth in a number of neat and very pertinent paragraphs how, by the institution of "Organized Science Schools," afterwards disguised as "Schools of Science," and by the payment of high grants for the devotion of a large slice of the school week to science instruction—by these things the curricula of these schools became lopsided. Languages, the mother tongue amongst them—the humaner studies, in a word—were snowed under. And the powers that be had need to set to work to undo the evil they had done.

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And its Inwardness.

HOPES are held out by the statistics given in Circular 705 that progress has been made towards redressing the balance between the two sides of school work. The latter half of the Memorandum is the outcome of a motion in the House of Lords for a return of the number of hours spent weekly in the teaching of Latin, French, German, and Spanish in the secondary schools on the Board of Education's grant list. The Memorandum at some trouble and length explains how such a return is impossible, or if made would be, owing to a variety of causes, devoid of significance. A flavour befitting the title of the Circular is cast over the whole by a few remarks at the close on the experience of the secondary school language inspectors. One of these is really good. "The recent development of the so-called 'oral' or 'conversational' methods has somewhat defeated its own ends, owing to the adoption of such methods before a sufficient number of teachers properly qualified to practise them have become available." That is quite true, and there is no branch of teaching in which a greater need exists for thoroughly qualified, trained, enthusiastic teachers than language teaching. The remark of the Circular is impeccable in substance, but why spell the verb "to practise" with a "c"?

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Trade Schools.

THE question of trade schools and of schools for training special aptitudes has been much discussed, and judging from Superintendent Maxwell's recommendations to the Board of Education for the city of New York, it has been agitated there also. He cuts the Gordian knot by recommending that "shop work be provided for all boys, and sewing and cooking for all girls, who are twelve years of age or more in the elementary schools, without regard to the grade in which they are found." Also that "a vocational school for boys and a vocational school for girls who are over fourteen years of age be established." London has trade schools, and it looks as if New York would experiment in the same direction. The dying out of the apprenticeship system is a consequence of the phase of economic development through which many countries are passing, and how to replace it is a pressing question. The answer seems to be in this, as in so many other cases, "When in doubt apply to the school." One other of Dr. Maxwell's recommendations would meet with warm approval on this side of the pond—namely, that no teacher's pension should be less than 750 dollars per annum, and no head teacher's pension less than 1,500 dollars.

A HINT FOR HOLIDAY MAKERS.—Those of our readers who are planning a trip to Switzerland, or indeed to any part of the Continent, are advised to send for a programme of tours to the Belgian State Railway Offices at 53 Gracechurch Street, E.C. The cheapness of the railway fares advertised by this company is calculated to rouse the keen envy of the stay-at-home Briton.

MISS MARIE LÖHR AS LADY TEAZLE
in Mr. Tree's revival of "The School for Scandal."
(Photo by the Dover Street Studios.)

LITERATURE UNDER THE LIMELIGHT.

"AMIDST the mortifying circumstances attendant upon growing old, it is something to have seen *The School for Scandal* in its glory." Charles Lamb's words hummed gently in my ears as I left Mr. Tree's revival of Sheridan's masterpiece, and purposely avoiding a taximeter and other anachronisms, walked to Charing Cross radiating an atmosphere of the eighteenth century. I carried my umbrella as if it were a tall, gold-headed cane; the stride for which I am notorious was unconsciously forsaken for a mincing gait of feathery lightness; my companion assumed the form of a "dainty rogue in porcelain" (how well the delicacy of it matched her graciousness!); and when a sleepy porter opened a carriage door for me, I bowed with native though unaccustomed grace, and with a start found myself about to sweep my hat under my left arm, and implore him to precede me through the aperture.

The slamming of the door brought me back to the early twentieth century, and to the critical mood which best pleases my editor. "What," I wondered, "did Charles Lamb mean by 'all its glory'? Was the setting of the piece in his day to be compared with that arranged by Mr. Tree, which is now the talk of the town? Scarcely. Did the manager of Lamb's time pour out money like water, and secure for his audience an idealised representation of life among the *beau monde* in the period of the pannier? I do not think so. Besides, the man who could appreciate the varied smells of Fleet Street in the days before the advent of sanitary science and the London County Council would not be carried away by perfection of taste in external matters. His comments upon the play refer almost entirely to the players' interpretation of the dramatist's purpose. It is the picture which he looks at and not the frame, beautiful though the latter may be—as a frame. Yet with what may well appear to be a strange perversity he pronounces the play to be purely artificial comedy: "The escape from life, the oblivion of consequences, the holiday barring-out of the pedant Reflection—those saturnalia of two or three brief hours well won from the world." And he smites the moralists hip and thigh. "We have not the courage to imagine a state of things for which there is neither reward nor punishment. We cling to the painful necessities of shame and blame. We would indict our very dreams."

Mr. Tree ventures to disagree, and upon this matter is no less definite than he is eloquent. "*The School for Scandal* is essentially a human document; in watching this play we needs must yield to its inherent passion. Although it may be true that the genius of Sheridan was greater in the direction of wit than of humour—and the greater of these is humour—the abiding sway of *The School for Scandal* is surely due to the heart interest with which it is informed. It is the very humour of the heart, despised by pedants, which has preserved and will preserve this masterpiece. Ephemeral intellect, grimacing at sentiment, owns but its little day. Humanity abides; cynicism is the humour of hate."

As a student of the play considered as literature I have always been impressed with its responsibility, and cannot help feeling that Mr. Tree's general interpretation is right. But I am not so sure that his presentation of the play gives full effect to his own reading of the dramatist's purpose. If he had taken the hint supplied by Lamb himself, he would have assumed the part, not of Sir Peter, but of Joseph Surface.

With unerring aim Lamb hits the centre of the target. "The hero," he writes, "when Palmer played it at least, was *Joseph Surface*." As this accomplished villain stands out by virtue of his black velvet and silver among the delicate shades of the rest of the moving picture in Mr. Tree's revival, so his character dominates all the others. He is the strong man of the piece, the player to whom the rest are pawns. There is no foil to him except virtue, which is, however, not personified in this play. Shakespeare, with greater knowledge of the limited powers of perception of an audience, and its unlimited power of making mistakes, would have introduced her as a Chorus, to remind the spectators that they were watching the inevitable contest of vice and virtue, and to warn them to expect the no less inevitable result. Sheridan is less obvious, more subtle, though his meaning is plain enough in all conscience.

As a literary artist of the first rank, he remembers that the attention of the spectator must be forcibly arrested at the beginning of the play by something which will impress upon him the central dominating idea, and, further, that at the end the same forcible impress must be made upon the mind in order to enable it to see and remember the unifying motive of the piece. How is this accomplished?

Joseph Surface appears in the first scene—and in the company of Lady Sneerwell. As we have already said, he dominates the whole play. And in the final scene, among the commonplace and somewhat irrelevant reconciliations and New Year resolutions of the more or less minor characters, his figure and that of his partner

in guilt rivet the flagging attention—*by leaving the room*. A lesser dramatist would have reformed him. But as we have said, he personates the refinement of vice, and can no more be reformed than virtue can be degraded.

The part of Joseph Surface is taken by Mr. Basil Gill, who plays it conscientiously and capably. He is, however, too anxious to please, and he succeeds too well. His performance is too smooth, too well polished. He ought to pay his audience the highest of compliments by assuming that the more they hate him as Joseph Surface the better will they admire him as Mr. Basil Gill. He does not give the careful spectator the impression that he *can* play upon Sir Peter, at least the Sir Peter of Mr. Tree.

For the elderly husband as here represented is no mere butt of the younger generation, but a fine old English gentleman, who, like his own wine, has been improved by the lapse of years. Such an interpretation of the character reconciles us to the fact that the volatile Lady Teazle can look forward to a life of humdrum married happiness without a qualm. After the necessary period of mutual misunderstanding, of angry recrimination on the one hand and playing with fire on the other, Mr. Tree lifts the character out of its secondary place, and by his very personal success scores an artistic failure.

Miss Marie Löhr undertook a stupendous task when she assumed the character of Lady Teazle—a weight, indeed, too heavy for her youthful shoulders. Personally, she is grace incarnate, but for a squire's country-bred daughter she has learnt the lessons of the town somewhat too quickly. She ought to remind us rather more often and more forcibly that there was a reason why Sir Peter fell in love with her, and not to leave us with the impression that he may speedily repent of the reconciliation with which the final scene concludes. In the mansion of that country squire she had, we feel sure, some of the sweetness which charms us in the Maria of Miss Dagmar Wiehe, else she had not captivated Sir Peter. But this is ungracious. Her performance, under all the conditions, bespeaks for her a brilliant future, and stamps her as one of the most promising players of the day.

The merriment of Charles Surface ought to be infectious, and Mr. Robert Loraine has a laugh which disarms criticism. He swaggers well, and he succeeds in giving to the character a wistful turn which imparts a piquant touch to his selfishness. He has a pretty knack of filling a glass at a distance of some three feet, and altogether he plays the rollicking blade in a manner which appears to delight himself as much as the audience. But we can no more believe in his profligacy than in that of his brother.

To say that the rest of the remarkable cast which will become notable in the annals of the playhouse acquit themselves with credit is to convey an utterly inadequate idea of their individual and collective excellence. Where all are so good, it is somewhat invidious to differentiate. But I was especially charmed with Mr. Henry Melville's Sir Oliver, one of the most lovable of characters in English comedy; with the Maria of Miss Dagmar Wiehe, who plays a somewhat vapid part in a fascinating manner, and helps to create a few scenic effects which dwell in the memory; with the Mrs. Candour of Miss Susanne Sheldon, and the Lady Sneerwell of Miss Ellis Jeffreys. The achievement of the last-named player best of all remains fixed in the memory as a finished performance, an artistic triumph.

But how good it all was, how completely enjoyable, whether one indulged the critical mood or simply gave way to enjoyment of the hour! Could we ever forget the delightful minuet—a rhythmical moving feast of colour, with its byplay of gesture and of speaking glances, such as kept up the thread of the story by a few delicate touches completely in harmony with the dramatist's method; the beautiful music made up of selections from the best of eighteenth century composers—Domi Cimarosa, Padre Martini, Monteclair, Handel, Purcell, Bach, Gluck, Rameau, and Rousseau; the impression of careful ease which the whole performance made upon the spectator; the beautiful costumes and household appointments, which were in themselves an education for the student of the manners of a bygone time; and last, but not least, for the student of to-day, the evident enjoyment of the audience?

MR. TREE AS SIR PETER AND MISS LÖHR AS LADY TEAZLE.

(*Daily Mirror Photo, by permission.*)

One was struck with the freshness of the good things which follow each other in quick succession throughout this brilliant comedy. How well they fit an age which in external matters differs so greatly from that of Sir Peter and Sir Benjamin Backbite. How we enjoy them as they recur; how we eagerly expect them, and taste their flavour as Sir Peter and Sir Oliver tasted their wine. The play is perennial, the players have created a piece of dramatic history, and the whole performance has established for the present generation a memory as fragrant as the fresh innocence of the dainty, sweetly-serious Maria, the ward of Sir Peter Teazle.

The New Constructive Movement.

WHAT IS BEING DONE IN THE MOST PROGRESSIVE SCHOOLS TO MAKE THE PRIMARY TEACHING TOUCH EVERYDAY LIFE AT ALL POINTS.

SUGGESTIONS FROM AMERICAN SCHOOLS.

BY W. H. WINCH, M.A.

LAST month I gave in outline the varying educational views which, in the United States, are grouped together under the general title of kindergarten, and promised to deal with constructive work in so far as it was operative in the teaching of the children who attended these classes. For kindergartens in America are not schools but classes; there may be one, or at the most two, in a school containing many hundreds, or even some thousands, of children. Attendance in these classes is always optional, and is not usually even permissible till five years of age, though in some cities I saw a few four-year-old children present. At six the pupil must ordinarily pass out of the kindergarten into the primary school, the name given to the lower grades (we say standards). The problem of the three- and four-year-old (or babies' class, as we call it) does not exist for the American teacher; and at six the child begins his standard work, the definite work of the grades. I ought rather to say, is supposed to begin, for large numbers of children, though attendance is legally compulsory at six, do not begin school at all until they are over seven years of age. Grade I., in fact, whatever it may be in theory, is decidedly older than our "sixes' class," or what is known in London schools as Grade III. These facts of organisation are necessary if we are ever properly to understand either the sequence of work, the methods employed, or the attainments of the children. But though the children of Grade I., and, indeed, of other grades, show great variation in age, that is not the case with the children of the kindergarten; they are really very young children, separated from the senior schools by a definite age limit.

It would be interesting to trace out the effects of the varying views and of the different theories of kindergarten upon the manual work of these little children; but that would require a book rather than an article, and I must content myself with a general and less differentiated account. I shall show first what is aimed at, and, secondly, give a few examples of what I saw done, not, *bien entendu*, in specially selected classes, but in the ordinary course of ordinary school work. Probably the syllabus of New York may be found most typical.

New York city has recently—very recently—attained to a complete organisation of its educational system, and its syllabuses are very valuable both as indications of what is up-to-date, and what has been found more or less justified by American experience generally. There is a conservative note and a progressive note, more or less harmonised into a satisfactory whole. American municipalities do not jump violently as we do (Is it the influence of recent Boards of Education?) from one educational extreme to the other. "But we thought every educational 'crank' (the conservative says), 'reformer' (the progressive says), had a free hand in the States," my reader may interject. Yes, as the Yankee would say, he "gets a show somewhere," but he does not dictate the syllabuses of the municipalities. I know several excellent infants' mistresses who will call the following syllabus very conservative, and I am not sure that they are wrong. Perhaps that is not always a bad thing, but let the experienced teacher judge for herself.

Handwork.—New York Syllabus.

The handwork is suggested by the Kindergarten Gifts and Occupations. It includes building with blocks (Gifts II. to VI.); designing and outlining common objects with tablets, sticks, rings, and seeds; modelling in sand and clay; drawing, both illustrative and object, with heavy crayons; daily practice on the blackboard; painting, both illustrative and object; weaving with coloured splints in heavy manilla mats, and in paper mats with fringes of inch and half-inch widths; occasional free weaving with grasses and raffia; sewing with or without a needle; paper-folding of simple forms and objects developed from squares, oblongs, and circles, the cutting to be free and illustrative, or restricted to the crease and line; construction of simple objects by combining paper-folding with cutting and pasting.

No occupation work should be introduced which is injurious to the eye, such as fine perforating, fine sewing, and fine weaving. The work with the gifts and occupations should be partly directed and imitative, and partly inventive.

In order to co-ordinate the kindergarten and the primary grades, the kindergarten exercises should be modified towards the close of the term in preparation for promotion. There should be periods of silent work and a greater proportion of independent work in the advanced group. (The division of a class into sections is a favourite American device.) The close connection between the kindergarten and the first year of school work is indicated by the topics under which the kindergarten occupations are classed in this syllabus.

This syllabus cannot be said to fail for lack of comprehensiveness. It is rather more American than most of the New York syllabuses, for they are usually marked by more moderation and definiteness than is typically American. Two points of excellence may be emphasised.

First, the attempt to unite the imitative and the spontaneous. Our educationists are theoretically split into two hostile camps, one believing that everything will come out of the child if you give him things to do which he likes, the other believing that you can get nothing out that you do not put in by definite instruction.

Surely it is time for us, too, to admit in theory the virtues of a combination of instructed talent and individual initiative. In practice every excellent teacher has effected this conjunction; she has to, and must, guard against the indefinite repetition of error on the one hand and stereotyped uniformity on the other. I cannot say that American kindergartens were entirely successful in either operation; the lessons given as illustrations will, I think, bear out my contention. Secondly, the correlation between the kindergarten and the primary grades is set forth as an object to be attained. Again I cannot say that the ideal is realised; the teachers of Grade I. were practically unanimous in saying that they had to start everything they wanted *ab initio*.

Let me now illustrate the syllabus with the aid of some lessons in being.

MILWAUKEE, WISCONSIN, MIXED ELEMENTARY SCHOOL, KINDERGARTEN CLASS.

This class, in two sections, *more Americano*, occupied a large, fine, well-lighted room with much open floor space. One of the two sections consisted of seventeen children of from four to four and a half years of age. They were seated on little chairs at flat-topped tables with chequered surfaces.

In front of each child was lying a flat block with a hundred holes in it, ten in a row, and a box of little pegs, one inch long, of different colours, for insertion in the holes.

Teacher. Put a row of pegs at the back.

This direction had only a confused result, for "the back" was a vague location to these infants.

Teacher. Where is the back—farthest away or nearest?

This question cleared things up a little, and the pegs began to go in.

Teacher. Now put a row in front.

This was satisfactorily done.

Teacher. Now put in a row of green pegs. Now take out five. Pick out all the blue pegs that you have put in the board.

Blue pegs and violet pegs came out together, naturally enough.

The teacher pointed out to me that many variations could be made in these exercises, all employing the children in an interesting way, and developing their sense of position, of colour, and of number. An English infants' mistress, who has read these lessons for me, thinks that position, colour, and number cannot be taught successfully at one and the same time, and that the colour names especially could not be thus taught. Perhaps, I may add, the colours themselves, apart from their names, could not all be discriminated at that early age. But I am not sure that this *alternation* of treatment between colour, position, and number may not be educationally wise; it certainly would be after a *few separate* lessons on each conception.

Another and older group of children were laying tablets on a chessboard from instructions like the following, "Move the tablet from the right top corner to the left-hand bottom corner."

The next illustrative lesson was given in a small but wealthy township some thousand miles from Milwaukee.

BROOKLINE, MASSACHUSETTS, MIXED ELEMENTARY SCHOOL, KINDERGARTEN.

Thirty-three children were present, from four to six years of age. At the age of six the child must pass into the grade classes, but up to that age the children in this town had no regular programme, I was told—a condition of things very un-American.

The room was large, fresh, and light, with long low desks with chequered surfaces showing one-inch squares, and little chairs; and there was plenty of open floor space.

There were two teachers to these thirty-three children, and a maid to help—this was a very wealthy town. Kindergarten teachers in the United States have small classes, be it noted; their pay is, however, considerably less than that of grade teachers.

No direct preparatory work was done for entry into the senior classes, except a little number work in the upper section, in which the children counted up to eight, added two and two, but worked no arithmetical problems, either concretely or otherwise. The directly preparatory work of the lower section consisted merely in the correction of errors in speech, I was told.

But the manipulatory work seemed considerable. Little pieces of wire of different curvatures thus—

Fig. 1.

had been worked up into patterns, such as—

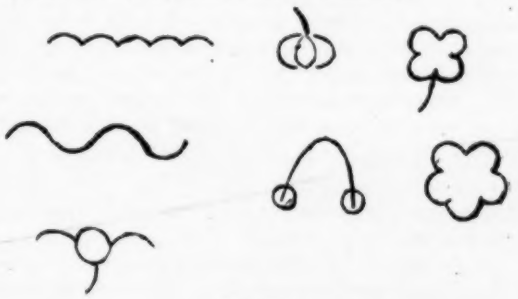


Fig. 2.

and some figures in three dimensions had been obtained by inserting little wooden splints into marrow-fat beans soaked in water overnight. Then there were butterflies, umbrellas, and other known objects, which had been drawn by the teacher, cut out by the children, and mounted on thick paper. The children had painted tulips and daffodils drawn by the teacher, had cut and

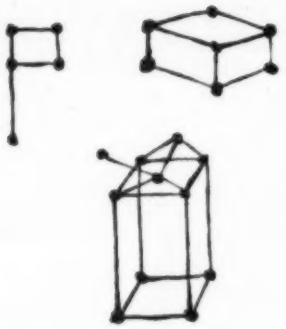


FIG. 3.

folded paper, and had woven mats. They had drawn squares and oblongs, and sewn on cards in the way well-known to our own infant teachers.

I did not see the above work being done, but saw many specimens of it, some very good. On the morning of my visit the upper section was trying to construct with wires the following pattern :—

FIG. 4.

The attempt was a complete failure; only one child had made anything like it. The teacher thought they were *expressing their ideas*, but I thought they were exhibiting their incapacity for observation. Of course, the copy was far too difficult.

English teachers will not, I think, agree with some of the procedure indicated above. Some of them have said that children who could execute difficult work like that with the sticks and beans ought certainly to have made further directly preparatory work towards the grades. The painting and cutting-out, too, were of the teachers' drawings, not of the children's. One teacher said, "We have left these occupations far behind." I am just a little doubtful, however, whether the manipulatory dexterities required by these "occupations" are always cultivated at home. If there is to be a preparation for truly constructive work, may not something of this kind still be necessary?

(To be continued.)

A DUSTLESS CHALK.

MESSRS. GEORGE WRIGHT AND CO. of Bayer Street, London, send us specimens of their "dustless" chalk, which we have tested in the schoolroom, and hereby declare (1) that it is particularly pleasant to use owing to absence of grit and grease, (2) that it is easily erased in the ordinary manner, (3) that the amount of dust is reduced to a minimum, and (4) that it is of uniform quality, giving a good account of itself in this respect even on a board of inferior surface. For freearm drawing we have seen nothing better. The wooden holder with brass ring, supplied by the firm at a nominal price, is particularly useful.

TWO CONSTRUCTIVE HINTS.

BY "OBSERVER."

MOLIÈRE'S M. Jourdain was astonished when he learnt that all his life he had been talking "prose." And now I find that for a very considerable time I have been an active participator in the New Constructive Movement—if, indeed, I interpret Mr. Winch and the Editor aright.

I watched a class of little ones find out, with the help of the accompanying picture (No. 1), how many more onions there were in the basket than in the dish. Then I said, "Now, suppose they were not onions, and it wasn't a basket nor a dish;" and we agreed that they might have been apples in a bag and on a plate respectively. Further, we agreed that there might have been, say, 10 apples in the bag and 4 on the plate. In a few moments the new sum was roughly sketched and then worked.

My little people seemed to think this great fun, so we tried again. Having been told that 23 of the eggs in the box (No. 2) proved to be bad, they discovered the number of good, or, let us say, "better" ones. Then by a touch of the magician's wand we changed the eggs to oranges, the box to a sieve, the numbers to 56 and 22 respectively, and found out the number of good oranges—after, of course, sketching the sum as before.

On another occasion I took a poetry lesson with an upper standard. The pieces set for repetition were somewhat hackneyed, and the poets were at a discount. "Come, now," I said, "let us make our own poetry-book;" and what followed occupied a good many lessons.

I selected from the books in my own library some pieces still protected by that ogre, the Copyright Act. These were copied down in a MS. book by each pupil, but we made up that book in a way which would have delighted Caxton.

We bound it in brown paper, and decorated the cover with a post card showing Fred Peacock's "Sisters" in the Tate Gallery. We used as frontispiece another post card, and had a decorated title-page, a list of contents, page headlines, illuminated titles, and other delights. When the book was finished the poetry lesson was no longer drudgery, and the only person dissatisfied was the publisher's traveller.

I think this was "Constructive" work too. If not, perhaps I shall be duly corrected. My colleagues have already jeered at me for "wasting time."

GUIDE BOOKS FOR ALL AND SUNDRY.—At this time of year our readers are usually looking round for books which do not pretend to be ornamental but practically useful—books which will serve to make the vacation not only enjoyable but of practical value from a professional point of view. After much experience of the guide book, we can with confidence recommend Messrs. Ward, Lock, and Co.'s well-known scarlet volumes. They are clear, complete, well illustrated, provided with useful maps, and, owing to their popularity, marvellously cheap. Ask for a "Ward Lock Guide," no matter where you intend to go.

AS OTHERS SEE US.

BEING EXTRACTS FROM THE REPORTS OF AMERICAN VISITORS TO OUR SCHOOLS.

I.—Mr. Arthur V. Taylor's Impressions of the Elementary Schools.

MY visits to the elementary schools showed the greatest variations in the studies pursued. In a Liverpool school, with a building up to the best standard of present-day requirements, I heard some excellent conversational French by pupils of nine or ten years, and an interesting exercise in English by the next higher grade, in which parts of "The Deserted Village" were well delivered, followed by a discussion on the life and works of Goldsmith. In the same school there are physical and chemical laboratories. The classes were small, and the atmosphere studious and attractive. In another elementary school the building was poorly equipped, the classes were large, and the curriculum somewhat threadbare. The others that I visited presented variations between these two. While French and Latin are taught in some elementary schools, I was told that a reaction has set in against the introduction of foreign languages into the lower grades. One schoolman told me that experience showed that the progress in Latin below the secondary school was not substantial enough to warrant the time put on it, but that the early training of the ear and the vocal organs to the French and German languages was worth while.

Geography and history appear to be presented in a comprehensive way. The breadth of the British possessions and the country's extensive business interests make commercial geography an inevitable study. It is true, however, that the English youth, with all his advantages in this direction, may go astray, as was shown in a class where the teacher attempted to display the pupil's knowledge to an American visitor. She asked, "By whom was America settled?" "By convicts," was the prompt reply. The study of English history necessarily involves much of the history of other nations, though we found hardly enough stress put on the American revolution and the war of 1812 to flatter our vanity.

Arithmetic is the bane of the British teacher. To be practical, much emphasis must be put on business transactions, which means that young Johnny Bull is to be led through the intricacies of pounds, shillings, and pence. The American teacher cannot fully appreciate how comparatively harmless the decimal point is until he has heard an English class wrestling with a problem in profit and loss. Eloquent testimony to the arithmetical situation is given in the report of the chief examiner on the examination for the Junior County Scholarship in 1908. His tabulation of results shows that four-fifths of the boys taking the examination in arithmetic received marks below fifty per cent., one-half of them receiving less than thirty per cent.; only seven and a half per cent. of them received marks over seventy. The girls did not do quite so well as the boys. It is only fair to arithmetic to state that the results in English were not much better. It should be noted that arithmetic is carried into the secondary department.

The absolute lack of blackboard facilities for the pupils is partially met by the omnipresent notebook. Those that were shown me were probably at least as good as the average. But there were opportunities for seeing others that were not on exhibition. Whether the subject was mathematics, science, language, or cookery, neatness in penmanship and care in expression were the rule, both in the elementary and secondary schools.

In the recitations in English there was a somewhat noticeable constraint on the part of the pupils in the discussion of topics, a fault that was not absent in other subjects. In the rather rare exceptions where the pupils "thawed out," I was pleased by the clean enunciation and the excellent choice of language shown by the children. Memory exercises are strongly emphasised. In the little country school at Strathkinness, where the Newark invader was totally unexpected, there was a clever exercise in which the whole class took part in rendering parts of the *Merchant of Venice*. The composition work that I saw was of average quality.

The importance of a mid-morning cessation from study is recognised. The recess is not at all perfunctory; the pupils are expected to stir themselves. In one school I saw the teachers playing tag with the little ones; in another, in a crowded part of London, the boys were playing games on the roof playground. In some schools luncheon is served to the youngest children at the recess period.

In Edinburgh there is an excellent plan in operation during the latter part of the elementary course. At the age of twelve those pupils who intend to continue their school education beyond the compulsory limit are transferred to a "higher grade" school. Those who expect to leave school at fifteen continue in what is called the "supplementary department." Here the subjects are of a practical nature. Manual training, commercial geography, commercial arithmetic and mensuration, book-keeping, sewing, cookery, and other practical subjects adapted to the age of the pupils, are designed "to bring school instruction into closer touch with the actual conditions of everyday life." While the course is not strictly vocational, it aims to give a foundation for the work that the boys and girls are likely to take up on leaving school. Quite characteristic of Scottish educational ideals is the aim, even in this workaday department, to inculcate a liking for good literature.

II.—Miss Anna B. Hasbrouck on English School Method.

The discipline, especially in England, is excellent. There is a most cordial relation existing between pupil and teacher; but the lesson of obedience, prompt and unquestioning, has been well learned. I saw no talking whatever between the pupils of a class, except in Irish schools, even when they were sitting so close that they could scarcely raise their arms.

Corporal punishment is in use throughout Great Britain, but it is carefully guarded by the requirement that each case be reported with cause, method, and after effects. I do not think that corporal punishment accounts for the excellent discipline in the best schools; I believe that home training and the national ideals of orderliness go far to make the school a success. But one of the teachers whose class I visited told me that his brother was teaching in a school of slum boys, and that he could not maintain proper discipline five minutes without the privilege of using corporal punishment.

The English teacher feels that she must be able to answer on the instant any query which might arise in class. It would injure her dignity and lower her in the estimation of her class if she were to say, "I do not know; let us look that up together." This feeling leads

to the suppression rather than the encouragement of independent thinking and honest questioning; hence we find less originality and more following of set forms.

Especially is this true in the writing of compositions. The work is much neater and there are fewer mistakes than a class of the same grade would give us, but there is less spontaneity of thought. All of the work—composition, grammar, mathematics, etc.—is written and preserved in one notebook. This custom tends to diminish the amount of work done; for every page must be examined and marked by the teacher against the coming of the dreaded inspector, whose first work is to examine the books. This plan has its advantage in the forming of habits of correctness and neatness; perhaps the spontaneity and originality will come later.

The methods of teaching involve much more talking on the part of the teacher than ours, and only short answers from the pupils, who are not asked or encouraged to give lengthy recitations. In fact, the word "recitation" means only the giving of some piece of literature which has been committed to memory.

Few text-books are used. In the first place, they are expensive; but more than this, I was told that the use of text-books is out of date. The children are not expected or encouraged to find out anything for themselves. In an advanced class of a secondary school in Bristol, the history teacher told me that she never asked pupils to study a lesson from the book until she had first given them the story in her own words.

No reference work is done in the elementary schools, and no home work is required. I condemn this method of teaching as being a mere stuffing process; the children leave the elementary schools perfectly helpless so far as getting any serious thought from the printed page is concerned. They will never become intelligent men and women through the reading of biography, history, scientific works, or even of good literature. I believe this to be the most serious shortcoming of English elementary education.

The teaching of literature is handicapped by the difficulty of obtaining books. Such pieces of real literature as they have are often so much made over to bring them down to the child's understanding that they are not recognisable. I picked up a copy of *Ivanhoe* which was being read in a seventh grade; not more than ten pages of the original book could I find, the rest being a simple paraphrase. Longfellow's *Hiawatha* and Kingsley's *Westward Ho* are much studied. I saw some good work in Shakespeare in advanced elementary schools, and a lesson in More's *Utopia* in a secondary school. Much advancement is being made in this subject of literature; wideawake teachers are encouraging their classes to buy penny editions of standard works, and I saw some of these being used in school.

Stated lessons in Scripture are given each day, the time allotted being not less than thirty minutes. The outlines for these are more definite than those for any other subject, and the requirements in London are very heavy.

Science is considered very important, especially in the advanced elementary and secondary schools. Laboratories are thoroughly fitted up for individual experiments, and the work is carried on after modern methods. In fact, some of the educators feel that it is being greatly overdone, and that much money is thus spent which would do more good in other ways.

Girls are given much more work in domestic economy than with us. It is the aim throughout the county of London to give each girl in the last three years of the elementary school a half-day per week of this work, which includes cooking, laundry, general housekeeping, and careful buying. Text-books in household management are used. Besides this at least two hours a week are given to sewing, which means that practically one-fifth of the girls' time for three years is given to domestic work. Sewing is introduced in the third grade, and in some schools lower.

The question of promotions is not a very serious one; the usual method is to promote the class as a whole. I was told by several principals that it is an unusual thing to keep a pupil back. This is partly accounted for by the fact that the children are so thoroughly sifted and classified at eleven years of age. The secondary schools take the best, the advanced elementary the next best, the special schools the worst, thus leaving just the mediocre ones for the ordinary elementary schools.

In nearly all of the cities of England the printed courses of study are very brief, and are intended merely as suggestions. Head masters and mistresses are given much liberty in planning the curriculum, and even in deciding what the special bent of their particular schools shall be. Of course the character of the pupils determines the trend of the school also.

There are no school districts; any child can attend any school, but he is likely to seek the school where other children of his own social class attend, and also one which is not far from his home.

The question of teachers is a complicated one, for many persons are allowed to teach who have had no professional training, and who have no certificates. In the county of London, out of 20,000 teachers, 11,000 have been trained and 15,000 have certificates; but in other cities the proportion is far less. One principal in Bristol told me that half of his staff are uncertificated. Some are eligible for certificates, but do not apply for them, even though their possession entitles the holders to higher pay. The reason is that they would be put out and cheap uncertificated teachers put in their places.

AGRICULTURAL EDUCATION.

A SCHEME OF WORK FOR RURAL SCHOOLS.

BY W. FRANCIS RANKINE.

GENERAL considerations. — During the summer months there is always a rich store of material at hand for the rural teacher; often there is so much that a certain amount of judicious selection is necessary in order that the policy of the scheme of work is not lost to view. In the fields work is more or less at a standstill, except where the root crops are being carefully hoed, and this introduces a lesson on surface cultivation to which we referred in our June paper. The consideration of surface tillage follows as a sequence to the lesson on capillarity of soils, and at no time of the year is this physical property of soils so clearly emphasised as in July, with its usually high daily temperatures. In reference to plant study there is a wealth of available material, and for once during the year one is at a loss to know which plant type should receive first attention. There are multitudes of wild plants that enable one to demonstrate very completely the characteristics of the more common families, and there are hosts of floral forms that lend themselves to the illustration of florescence in general. Near at hand are the

myriads of insect forms that are ever carrying on the work of fertilisation, and withal there is no reason to tarry by the way in our work which July renders so fascinating and interesting. During the heat of the day it is particularly noticed that the leaves of the root crops and cabbages present a wilted appearance, and in seeking a reason for this we are led to the discussion of transpiration of plants. Such a lesson follows soil study in sequence, since there is a relation between transpiration and the moisture content of soils. In addition to these important considerations there are many insect pests that avail themselves of the equable conditions of a British summer in order to place their eggs upon various forms of farm produce. The study of these lowly yet important forms of life is one that demands considerable observation, and therefore it is highly educational for senior classes; in every rural area there is an abundant supply of data. In this paper the crane fly—known to the systematic scientist as *Tipula oleracea*, and to the country boy as Daddy Longlegs—is offered as a typical study. Those who follow this scheme will find little difficulty in applying the same procedure to the consideration of other pests, such as the wireworm and turnip flea beetle. With little care and patience it will be found possible to glean as much interest from the developments of these insects as from the butterfly and moth chrysalides which are so popular in most schools.

WORK FOR THE MONTH.

1. *Soil Study:* Surface cultivation.—How surface evaporation is checked and how surface soil moisture is conserved. The effects of mulching, hoeing, and rolling. Moisture content and its dependence upon the physical nature of the soil.

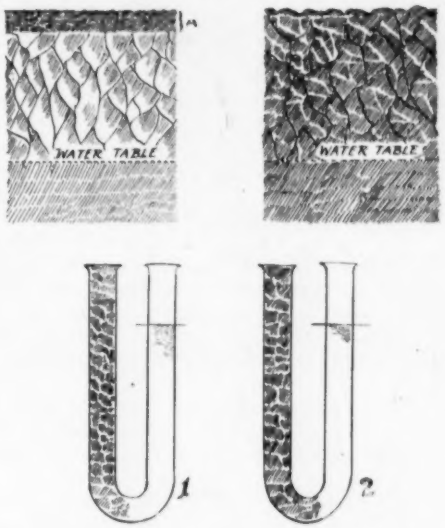
2. *Plant Study:* Transpiration.—The stream movement through the plant. Specialised leaf forms, and their relation to the rate and extent of loss of moisture. Cabbage and root crops compared with grasses. Experimental work to determine the extent and rate of transpiration.

3. *Insect Study:* The crane fly.—Its life history and work of destruction in relation to farm produce. How to observe the phases of development.

Soil Study.

Surface Cultivation.—In our first lesson we dealt—somewhat briefly, it is true—with the question of capillarity of soils, and now we proceed to show how important is this physical process in matters agricultural. At first sight it would appear that the fortunes of the soil were exclusively dependent upon the vagaries of climate, a wet season producing moist conditions and a dry season *vice versâ*. This, however, is not quite true, and a study of capillarity, depth of water-table, and the condition of the surface layer will reveal that, throughout a dry season, it is possible for the cultivator to conserve some amount of moisture for his crops.

Surface cultivation embraces hoeing, harrowing, raking, and rolling; ploughing is also a surface operation, but its object is not related to our lesson. The aim of the previously mentioned processes is to obtain a fine state of the soil immediately upon the surface, and incidentally many weeds are removed. The exact influence of this fine layer is to conserve moisture during the dry season of the year, or, in other words, it retards the rate of evaporation of moisture from the surface; the heat of the sun and the action of the wind accelerate this process. In the lesson which follows it will be seen that large amounts of moisture are being lost by transpiration, and thus it is doubly important that this fine condition of the surface soil shall be secured. This conservation is illustrated by the accompanying diagram:



the two top figures represent sections of soils in which the left-hand one has been subjected to surface tillage, and in the other no such operations have been carried out. The water-table marks the level of the water reserve, above which is the region B, through which water rises by capillarity. A represents the fine surface layer. In the first figure the upward passage of water progresses until A is encountered, and then it is checked, while in B it passes on and is evaporated. Thus without surface cultivation the water reserve is quickly exhausted. (This lesson will be correlated subsequently with a discussion of soil physics, with special reference to water content of soils, in which direction much interesting experiment is possible.) In this particular lesson it is possible, with the help of two wide-bore U-tubes, to demonstrate that a fine surface layer retards evaporation. (See diagram.) One is nearly filled with ordinary soil taken from a garden, and then filled with a layer of particularly fine soil; the other is filled with ordinary soil and no fine layer is added. Fill with water to the height indicated by line, leave for twelve hours, and note which has lost most moisture.

Plant Study.

Transpiration.—In hot weather the effect of transpiration is very apparent in the fields, where large-leaved crops are growing—crops such as the cabbage, swede, or mangold. At midday and through the afternoon they present a wilted appearance, and this is entirely due to the loss of water from the plant system by a normal, physical process. Transpiration is always proceeding, but naturally its effect is more pronounced during hot weather because it is accelerated, and the loss of moisture through the leaves goes on at a quicker rate than the assimilation of moisture by the roots. The exact behaviour of transpiration can only be demonstrated by actual experiment, and in this direction there are many forms of apparatus available for the work. The following is one of the best forms. Take an exhaustion flask, and fit it with a rubber stopper

through which is bored a hole to take the stem of the plant to be experimented upon. To the side tube of the flask fit a length of glass tubing to which is fixed a graduated paper scale. (If a burette is obtainable, it should be substituted for the tubing, for then the readings may be made with ease.) When ready for use the apparatus will present the following appearance. It

is filled with water, and great care must be taken that the stopper is air-tight. Observations are extended over several hours; the time and height of water in the tube are carefully recorded. With these results it is possible to determine many interesting facts relating to the transpiration of plants. The area of leaf surface of the plant may be determined by means of squared paper, and thus the loss of moisture per square centimetre or square inch is known. Several plants may be experimented upon, and thus the influence of the size of leaf may be clearly demonstrated; for instance, grasses may be shown to transpire less than a cabbage. The following are results obtained from this experiment made upon the laurel on the 29th and 30th of March of this year.

Transpiration of Laurel.—Area of leaves, 365·4 square centimetres.

Time.		Fall of Liquid in Tube in cms.	Loss in gms.
29th.	11. a.m.	level.	
,,	12 a.m.	·2 cm.	·4 gm.
,,	12.30 p.m.	·3 cm.	·6 gm.
,,	2 p.m.	4·5 cms.	·8 gm.
,,	2.45 p.m.	5·2 cms.	1·0 gm.
,,	4 p.m.	6·5 cms.	1·2 gms.
30th.	10.40 a.m.	17 cms.	3·4 gms.

Note.—The temperature of the room in which the experiment is performed should be noted.

This lesson leads to the examination of stomata and stomatic control of transpiration; this will follow in our next paper.

Insect Study.

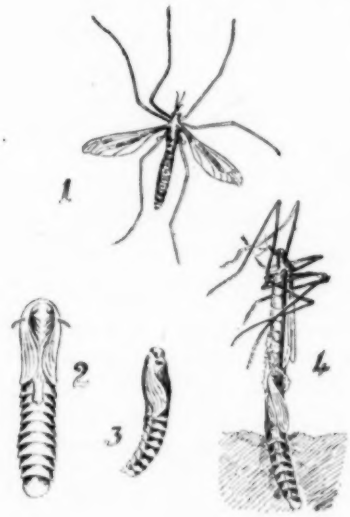
The Crane Fly.—Perfect specimens of this interesting insect pest are easily obtainable during the summer months. There are two well-known species, but it is not advisable to enter into detailed discrimination; both are harmful to farm produce.

Life History.—1. The perfect insect. The wing expanse is about two inches, but varies with the sex. The female insect is provided with an *ovipositor*, or egg-placing tube. Fixed to the side of the thorax, near the wings, will be noticed two tiny bulb-shaped processes; these function as balancers of the body in flight. The long thin legs enable the insect to hang almost unseen on grass stems.

2. The egg. This is placed by the insect upon the soil and on plants, and it is believed that the hatching period extends over two weeks. From the egg emerges a grub, which at once takes up its quarters in the soil there to destroy the roots of plants. It is during this phase of its existence that the crane fly is so destructive to the farmer's interests; probably the grass lands suffer most.

3. The grub. This is popularly known as the "leather jacket" on account of the toughness of its covering; it will not be a difficult matter to obtain specimens from the fields. It should be noted that it is provided with strong, biting jaws.

4. The pupa. This is particularly interesting. As shown in the accompanying diagram, each segment is provided with a pair of bristles pointing downwards, and these enable the pupa to wriggle upwards through the soil when the insect is ready to emerge. No. 3 is



The Crane Fly (*Tipula oleracea*).
1. The perfect insect. 2. Pupal case. 3. Pupal case (side view). 4. Fly emerging from pupal case.

a side view of the same. No. 4 is a drawing actually made at the time of emergence of a crane fly on the 22nd of May this year. By the time that the fly had freed itself the pupa case was lifted out of the ground through the struggles of the insect. This interesting change may be observed easily if a few pupæ are kept in a vessel containing fairly moist soil.

For the Student of Architecture.—Those of our readers who will include cathedral cities in this year's holiday itinerary must not forget Messrs. Bell's cheap and handy series of guide books to these "anthems in stone" which keep freal the ideal in our work-a-day world. The series now includes all the great churches of importance in the country, and each volume is adequately illustrated in a manner no less serviceable than it is artistic.

THE PRAISE OF FAMOUS MEN.

BY ALBERT E. ROBERTS, M.A.

(*Continued from page 545.*)

SHOULD the teacher desire to commemorate the centenary of Lord Houghton, that Mæcenas of poets, the patron of Swinburne, he might proceed on lines similar to those already laid down. It may be of interest to the reader to remember that Houghton is the Mr. Vavasour of Beaconsfield's *Tancred*. Such poems as "Lady Moon, Lady Moon, where are you roving?" and "Good-night and Good-morning" are used everywhere for young children. Such poems as "I wandered by the Brookside," "The Long Ago," "St. Mark's at Venice," and "Strangers yet" may be used with the upper classes.

Most of the poems of Lord Houghton have been set to music, and of these the most beautiful are "Strangers yet," and "The Beating of my own Heart." The last named is so called from the refrain of "The Brookside," and is included in the second Star Folio (price 1s.), published by W. Saville and Company, Bruce Grove, Tottenham.

In the case of Edgar Allan Poe, the American poet and prose writer, there is scope for a good centenary commemoration. Reference should, of course, be made to the fact that he was in reality the originator of the short story. Such a poem as "Annabel Lee" is simple enough for almost any standard, and the exquisite musical setting by Henry Leslie (published by J. B. Cramer, 207 Regent Street, price 1s. 4d.) will appeal readily to any teacher who goes to the trouble of procuring it. There is no need to suggest any definite poems or short stories, though one very powerful tale, "The Maelström," is to be found in Messrs. Nelson's new literary reading book, *Tales that are Told*. Readings from such stories as *The Gold Bug, Manuscript Found in a Bottle*, will also serve the teacher's purpose.

Oliver Wendell Holmes may be dealt with similarly. The "Breakfast Table" trilogy will probably form the groundwork of the celebration. Readings from these will include, of course, some of the poems—for example, "The One-Hoss Shay," and "The Chambered Nautilus." *The Autocrat of the Breakfast Table* is Dr. Holmes's most typical work, and contains his fundamental characteristics as a writer.

If there are so many anniversaries that it is impossible fully to do honour to all the heroes who were born in 1809, at least it will be possible to devote one day towards the end of the year, for which a programme may be arranged in commemoration of all. Those who would do honour to Kinglake, famous as the historian of the Crimean War, may include in such a programme readings from *Eothen*, which describes the author's travels in the East—for example, the passage on "The Dead Sea" in Chapter XIII. A selection from Edward Fitzgerald's *Rubaiyat of Omar Khayyam*, and a eulogistic speech or two in commemoration of Charles Darwin, Abraham Lincoln, or Gladstone will also be possible from the boys or girls at least of secondary schools. Here is a composite programme of the kind I mean, suitable for the secondary school, from which selections may be made suitable for any type of school:—

A speech by one (or two) of the upper boys, explaining the purpose of the celebration, and briefly referring to those in whose honour the entertainment is arranged.

Recitation—Poe's "The Bells" or "The Raven."

Song—Edgar Allan Poe's "Annabel Lee."

Recitation—Kinglake's "The Sphynx."

Song—"Beating of my own Heart," or "Strangers yet" (Lord Houghton).

Recitation—Passages from Fitzgerald's *Omar Khayyam*.

Pianoforte Solo—Mendelssohn.

Song—Tennyson's "Crossing the Bar."

Recitation—Wolfe's "Burial of Sir John Moore." (The teacher will remember that Sir John Moore was *buried* at Corunna in 1809.)

Reading—From Oliver Wendell Holmes's *Autocrat of the Breakfast Table*.

Recitation—Holmes's "The Deacon's Masterpiece."

'Cello Solo—Chopin.

Recitation—From Professor Blackie's translation of Æschylus—for example, the messenger's speeches describing the battle of Salamis in *The Persians* (pp. 314, 315 "Everyman's Library," price 1s.), or from the speeches of Prometheus in *Prometheus Bound* (pp. 185, 188, etc.).

N.B.—The secondary school teacher should note that Professor Blackie was also born in 1809.

Speeches in eulogy of Gladstone as statesman, theologian, and man of letters.

Dramatic representation—for example, a scene from Æschylus or Tennyson.

Lantern lecture by teacher, showing portraits of these famous men.

A MENDELSSOHN PROGRAMME.

1809–1847.

1. Pianoforte solo .....Sieben Characterstücke. Op. 7.
2. Pianoforte duet .....Symphony in C minor. Op. 11. 1824.
3. Part song .....Spring Song.
4. Pianoforte solo .....Andante and Rondo Capriccioso. Op. 14. 1827.
5. Overture (Pianoforte quartet)..... Midsummer Night's Dream. Op. 21. 1827.
6. Song .....By Celia's Arbour. 1829.
7. Pianoforte quartet ...The Hebrides. Op. 26. 1829.
8. Pianoforte solo .....Concerto in G minor (one movement). 1831.
9. Song from St. Paul..."Jerusalem, thou that killest the prophets." Op. 36. 1836.
10. Song .....Suleika. 1837.
11. Vocal duet from Hymn of Praise.. "I waited for the Lord." Op. 52. 1840.
12. Pianoforte duet .....Scotch Symphony (slow movement). Op. 56. 1842.
13. Song .....The First Violet.
14. Pianoforte solo.....Spring Song (Lieder ohne Worte). Op. 62. 1842.
15. Song from Elijah ....."Oh, rest in the Lord." Op. 70. 846.
16. Vocal trio—Elijah...."Lift thine eyes." Op. 70. 1846.

We have so far dealt principally with literary men. Many teachers may consider it difficult to celebrate suitably the centenary of a great statesman like Gladstone or Lincoln, owing to the seeming lack of material such as is offered by the poems and writings of literary men. With careful thought and intelligent discrimination it is possible to construct an interesting and pleasing festival.

Utilise the school notice board as before, by affixing annotated lists of books obtainable in the school or local library. The possession of Morley's *Life of Gladstone*, published by Macmillan in three volumes, and recently issued at 5s., is indispensable both to teacher and pupils for an intelligent appreciation of Gladstone. (Arnold's or Nicolay and Hays' *Abraham Lincoln* will serve the same purpose for Lincoln.)

As before, encourage the collection of pictures, photographs, and newspaper cuttings dealing with the subject.

Brief biographies will be found in most newspapers. Post selections from these in a position accessible to all. On December 29, the commemorative occasion, introduce the subject of the commemoration by a short conversation, drawing attention to the collection of pictures, photographs, etc.

The children may give in speech form a few extracts previously chosen, and in some instances committed to memory, from the more important speeches of Gladstone. His speech on "The Relation of the Motherland to the Colonies"—"If you want to strengthen the Colonies . . . govern them on a principle of freedom," etc. (Morley's *Life*, vol. i. p. 363)—is the expression of a great statesman; while his speech before the division on Home Rule took place—"Ireland now stands at your bar, expectant, hopeful, almost suppliant," etc. (vol. iii. p. 340)—displays his great sympathy with the Irish people. Some extracts from his speeches during his Midlothian campaign, of great human interest, and outside the range of party politics, may be selected; or, again, his words on the subject of "War" (vol. iii. p. 547): "It is indeed true that peace has its moral perils and temptations for degenerate man, as has any other blessing that he can receive from the hand of God . . . War has, in its modern forms especially, peculiar and unequalled evils," etc.

The mottoes at the heads of the chapters in Morley's *Life of Gladstone*, in many cases taken from his speeches, are replete with guiding principles, moral and intellectual.

There is much material here; but careful selection is absolutely necessary, and matter should be chosen on account of its general interest, its humanity, its sympathy, its patriotism, its grandiloquence.

The festival may partake of the nature of a speech day. Pupils may prepare speeches of their own on the statesman, or on any of the subjects so closely associated with his name—Free Trade, Reform, Home Rule, the Eastern Question, Egypt and Gordon. There is scope here for extensive and intensive interest. Debates on political topics among the older pupils of the school are brimful of interest, and are entered into with great zeal, though there is, of course, a danger in allowing young children to express their immature opinions too self-assertively. The teacher may allot a short time—half an hour—for questions relevant to the subject, and answers, allowing the pupils to answer where possible.

In conclusion, the teacher may give a short lantern lecture, using illustrative slides where suitable. Gladstone's life may conveniently be dealt with under these three headings—his statesmanship, his theology, and his literary work. There is no need to suggest in detail what the lecture should contain, but the lecturer should endeavour to show Mr. Gladstone as Lord Salisbury characterised him—"the greatest member of the greatest deliberative assembly the world has ever seen"—to show that as a theologian he was ever "jealous of the honour of whatever we hold as positive truth appertaining to the Divine Word and the foundation and history of the Christian community," and to show that "his literary life was part of the rest of his life." His Homeric studies, his critical essays on Tennyson and Macaulay, his translations from Horace's Odes were the diversion of a man of affairs with refined taste and keen interest in pure literature.

The highest praise that a man can be accorded was given to him in the Parliamentary tribute of his political opponent, who said he was "a great example of a great Christian man."

ON TELLING A STORY TO CHILDREN.

BY AMY BARTER, L.L.A.

THE art of oral story-telling, which our forefathers, in ante-printing days, exercised so successfully, has now fallen into decay. The great race of the old minstrels—of the Taliesins and Albert Graemes—has died out; while even that smaller measure of the gift of story-telling which would seem in former times to have been bestowed on the average individual, belongs now only to the favoured few. We prefer reading our stories to telling them or hearing them told, and as a consequence we are neither good raconteurs nor good listeners. A short anecdote is as much as most of us can manage with effect; if we attempt anything longer, we usually find the interest of our hearers flagging in the most unflattering manner before we have reached our climax. Some of us, indeed, when we have anything of special interest or importance to impart, choose to write our account rather than tell it by word of mouth, the artificial means of communication having become, for such a purpose, easier to manipulate than the natural. All of which means that the faculty of story-telling, having been allowed to drop out of use, is becoming atrophied, and is threatened with extinction.

Such a consummation would be a real calamity. As Carlyle reminds us, "There is still a peculiar virtue in Speech.....There is, and must ever remain while man has a tongue, a distinct province for Speech as well as for Writing and Printing. In regard to *all* things, this must remain." Happily there is among us a great unlettered public, now at last coming into its rights, which will probably, as time goes on, do much towards restoring speech to its proper place in regard to story-telling. The children will save us. They, to whom speech is still a marvel and books as yet uninteresting, have always been constant in their demand, "Tell us a story." It is probably owing to them that some small remnants of story-telling ability have survived among us. We have usually managed to respond to their request, when it has become too insistent to be evaded, by something which they, courteously respecting our efforts and recognising our limitations, have been pleased to accept as a story. Such acceptance, however, has by no means implied the attainment of the ideal. Any one who has seen a child or a group of children listening to one of the specially gifted story-tellers, of whom a few do still exist among us, will soon be put out of conceit with the quality of the attention and interest he has evoked by his own mediocre performance. If such an one be a teacher, and if he have in his composition any particle of real ambition, such a sight will arouse feelings of almost deadly determination. "If the art of story-telling can be acquired," he will say, "I will acquire it."

The art of story-telling *can* be acquired. Any teacher of ordinary gifts and capacity can become an accomplished, even a brilliant, story-teller, provided only that he possesses "the infinite capacity for taking pains." Every teacher may also become a pioneer in the great work of restoring to the race the almost lapsed gift of story-telling, for when he becomes an enthusiast in the art he will communicate this enthusiasm to his pupils. He will not only tell stories to them, but will teach them to tell stories to him; and he will continue this double process to the end of their school career, not leaving it, as is so often done, as soon as the children are

able to read stories for themselves. So a great reform (which has already been well begun in our schools) will be carried to a triumphant consummation.

How is this training in the art of story-telling to be begun? The first piece of advice which one would be inclined to offer may be expressed in the words of that perennially famous direction contained in the old cookery book, "First catch your hare." Learn to select a suitable story. Do not, unless you are a very exceptional person, trust to stories "out of your own head." The probability is that they will not spring—like Minerva from the head of Jove—strong, and full of vitality, and ready armed for their work, but will prove feeble and imperfect little bantlings, with little beauty, except perhaps in the eyes of their progenitor. Go out into the wide and open fields of literature and "catch your hare." And mind it is a hare, not one of the feeble and languid specimens of tame rabbits which have been kept in cages for so long, and brought out for the delectation of successive generations of children on the plea that they are so quiet and well-trained they cannot do any harm. This is true, but such a negative virtue is not all that is required.

The subject of the choice of a story is so important that it is well to give it very careful consideration. It may be useful to enumerate first some types of stories which the teacher should *not* choose. In this list we would place first those which are obtrusively moral. We do not desire to breed prigs in our schools; neither do we desire to strengthen that spirit—which is already too strong in the Anglo-Saxon race, and which takes so much from the pure joy of living—the spirit which is incapable of enjoying and appreciating a work of art purely because it is a work of art, but is all the time tormented with an anxious fear that it is not sufficiently "improving." The tendency of every story should be, it need hardly be said, to increase the children's love for what is high and for what is lovely; but the story should be a story, not chiefly a vehicle for the conveyance of instruction—moral or otherwise. The application of this principle would rule out many of the nursery classics in which our forefathers delighted—for example, *Sandford and Merton*, *The Fairchild Family*, Miss Edgeworth's *Parent's Assistant*, and *Ministering Children*. These, as we know, were regarded with almost reverential admiration by a former generation; yet with all respect to the taste of our forefathers, we cannot but think they would have been happier, if not better, had they taken their jam without quite so large an admixture of powder. Modern tales do not, as a rule, err so glaringly in this direction. Yet in many stories of the second or lower rank, the fault is to be detected without the compensating merits of the earlier works.

Next among tabooed stories come those which deal too exclusively with the sordid and gloomy side of life. Here—as possibly in the former instance also—stern moralists may disagree. School, it may be said, should be a preparation for life, and it is well that children should learn early to sympathise with the sorrows of their less fortunate brothers and sisters. I venture to maintain that the telling of stories of the type here referred to is not the best means towards this end. The children of the poor know the miseries of poverty only too well. The children of the well-to-do gain from such stories false and sentimental ideas of poverty, and are led to place an exaggerated value on money and the good things it can bring.

(To be continued.)

EDUCATION A FAILURE!

THE CURRICULUM AND THE TEACHER.

BY JOHN PERKINS.

ENOUGH has surely been said under this heading and in the contribution "The Van Boy" to demonstrate that things are not as they should be. Children are passing out of the elementary schools, drifting into unsuitable employment, and, through lack of resourcefulness and adaptability, ultimately going to swell the all too numerous class of paupers, unemployed, and unemployables.

The report under review suggests many remedies, which are more or less of an educational character—the raising of the school age, the development of compulsory continuation classes, the improvement of the physique by means of compulsory physical training, and the institution of after-career committees. The consideration of these can stand over for the moment while we turn our attention to that part of the Commission's indictment which touches us more closely.

In summing up their conclusions, the Commission say: "We must refer to one criticism which has been made with almost absolute unanimity. There seems to be outside the circle of the teaching profession a very strong feeling that the education of our children in elementary schools is not of the kind which is helpful to them in after life.

"Education is the accepted Antidote to Unemployment and Pauperism.

"The cost of education in this country in 1905–6 was twenty millions sterling. This is an almost entirely new national charge since 1870. It should have steadily reduced unemployment and diminished pauperism. If it has failed in this, its accepted mission, it cannot be said that its failure is due to lack of funds. The desire of the young to raise themselves in the social scale and improve their position should ever be encouraged; but this desire seems to us too frequently to take the shape of trying to avoid handicraft and manual labour by recourse to other occupations which, though associated with a black coat, are less remunerative and progressive than skilled handwork. Clerical labour is a glut upon the market; high-class artisans are, according to our evidence, at times obtained with difficulty. We doubt if the atmosphere of our school life is altogether congenial to a career of manual labour. We would suggest to the Board of Education the advisability of meeting these criticisms by a thorough reconsideration of the time-table and curriculum of our elementary schools, as well as the aims and ideals of elementary education. Though employers of labour may perhaps be apt to look at questions too much from their own standpoint, still the unanimity of opinion that our school curriculum does not supply the right class of instruction and training for industrial purposes cannot lightly be put on one side."

Probably this is putting the matter a little too high. The nation has had good value for its money. But that need not prevent us from making an endeavour to give it better value. While we cannot admit that the aim and purpose of elementary education is to train children for purely manual labour, we must realise that insufficient attention is being given to the development of the constructive sense.

Mr. Jackson, Chairman of the London County Council Education Committee, whose comprehensive report on

boy labour has just been published, after making suggestions for the improvement of post-primary education, says: "It must not, however, be supposed that the present education is all that can be desired. There is a widespread feeling that it is too academic, and must be made much more practical. In any case, it must aim at developing character and intelligence rather than merely imparting book knowledge."

Now, Mr. Jackson speaks as a man having authority, and his considered opinion cannot be brushed upon one side as though it were of no moment, especially as it is emphasised by many another witness who appeared before the Commission. We need not enshroud ourselves in a cloak of pessimism, nor need we join those whose mission in life it is to cry "Wolf" at the slightest provocation; but we must face the very general dissatisfaction with which the primary school product is being received. There is little doubt that

The Times demand Considerable Changes.

The day for the old shibboleths has passed away, and we must revise our school system. Take your curriculum as it stands to-day, sit down quietly, calmly, and dispassionately, put on one side all predilections and all personal bias for some pet subject, and look critically at the whole thing. Leave in all that you have *proved* to be valuable, and cast out all which you doubt to be useful or educational. What a number of leafless branches one finds in a tree on close examination!

Now consider the methods adopted to give life to your curriculum. How often would it be better for the child to be breathing the fresh air of the playground rather than to be condemned to a ponderous, soulless, lifeless lesson in the devitalising atmosphere of the classroom?

Do this—act the candid friend with the curriculum and the methods which you have to date unquestioningly followed, and you will be ready to take the plunge, and reform both out of recognition.

Here, then, is a reform which need not await the bidding of our legislators or our administrators. It lies absolutely within our own powers to apply the remedy; but if it is to be effective it must not be delayed. If you are convinced of the necessity for effecting improvement—if you have arrived at a state of healthy dissatisfaction with your work and aims, and are determined to make a new start, then

Do it Now!

What *is* the problem we have in hand? From all sides we hear complaints of deficiencies, and dismissing those from employers of labour, who are "apt to look at questions too much from their own standpoint," we find over and over again a demand for youths with character and intelligence. In Mr. Jackson's report on boy labour we read: "Mere skill of hand and eye is not everything. It is character and sense of responsibility which require to be fostered, and not only morals but grit, stamina, mental energy, steadiness, toughness of fibre; endurance must be trained and developed."

This statement of the case sums up succinctly the criticism of all those whose opinion is worth having. Of course there is no intention to assert that past generations of children were entirely lacking in these qualities. Such a sweeping generalisation would of itself render the statement valueless. The question is, Cannot we make improvement? As Mr. Hicks said at the last London County Council Conference: "I am not sure, having regard to the amount of public money that is spent on elementary education, that we could not do a little more with the same amount." How are we to do the little more that is required to make the youth of the country stronger in intelligence and character? Admitting that there are other educational influences at work, and that environment has an important effect, yet one cannot hesitate to assert that

The England of the Future is in the Hands of the Teachers.

Do we realise that sufficiently? We have intelligence, zeal, and enthusiasm, but is it being directed into the right channels? I am convinced that *we* can make England what we like if only we see the necessity and exercise the intelligence and determination which is ours. But there must be no one in our profession who has missed his vocation. We deal with the mind and soul of the child as the doctor deals with the body. The inefficient doctor soon becomes impotent; he sighs in vain for patients. It is not always so with the inefficient State teacher. Numberless children may be sacrificed through inefficient and unintelligent handling. So, then, we must look to the character and aptitude of the teacher who is to carry our curriculum into effect before we proceed to its elaboration. It would be futile to draft an ideal curriculum to place in the hands of an unsympathetic soul. There is a danger in these days of universal scholarships that unsuitable persons may be invited to adopt the profession of teaching. There is too much of

"Here is a Bright Child—make Him a Teacher,"

without considering the all-important question of personality.

A good man or a good woman, with strong moral fibre, forceful in character, sympathetic in spirit, with a large heart and a broad mind, will do more to strengthen character and intelligence than the most ideal of ideal syllabuses and time-tables. Yea, he may even put life and force into the most unpromising material.

Give me a teacher strong in character, alive to the magnitude and responsibility of the work, straight in limb and clear in eye, with a full knowledge of child life and of a child's mind, and the syllabus of instruction will be a very secondary thing in the development of the children.

There are they who will say that we expect too much when we expect all this—it cannot be obtained at the price. One can only reply that the cost must be counted *before* the work is undertaken; but once undertaken it must be entered upon with single eye and wholeheartedly. The price will follow. As sure as the night follows the day, a proper public appreciation will follow an adequate professional realisation of the duty which is expected of us.

The teachers, then, may become the salt of the earth; they stand daily in high places before the children of the nation; they create the mental and moral atmosphere; and no Education Act, no Education Code can help or hinder the work which they alone can accomplish in moulding the destinies of our imperial race.

In a subsequent issue we propose to pass to the detailed consideration of the school subjects and school methods and school environment.

Our Art and Handwork Section.*

ETCHING FOR ART STUDENTS.

BY HAROLD ARMITAGE.

IT has been frequently a matter for surprise to the writer of this article that so few who have attained to accurate drawing have ever proceeded to multiply their sketches by means of the etched plate. Possibly many amateurs have pondered the question, but having peeped into a manual upon the subject, have been appalled by the expense which seems necessary before a print can be produced. It may reassure these if the author explains how, with no more than the ordinary youth's skill in drawing, and by using things to be found already in most houses, he managed to amuse himself with etching upon an outlay of rather less than two half-crowns.

A few years ago writers began to confound etching with pen-and-ink drawing, so that we may consider first what precisely is meant by the term etching.

Suppose we take a small sheet of copper, and cut a line across it with a sharp instrument. Then, if we fill that cut with the thick black paste which we know as copper-plate printer's ink, and after that press paper into the cut that we have made upon the copper, a black line will be printed upon the paper. That line we should call an engraved line, and a steel engraving or a copper-plate engraving is obtained by cutting lines into a steel plate or a copper plate with a sharp tool called a graver, then by filling the lines with ink, and, after that, by printing the lines so filled upon paper.

If, instead of cutting our copper plate with a sharp

"PORTRAIT OF THE ARTIST'S MOTHER." BY ANDREW GEDDES.
(Photo by W. Rice.)

* Mr. Sparkes's contribution is unavoidably held over this month.—ED.

instrument, we had allowed a strong acid to eat a line into the copper, and we had inked and printed that line in the same way, instead of calling the printed line upon the paper an engraved line, we should have called it an etched line.

This, then, is the art of etching: to cause acid to eat its way in lines on a copper plate, to fill those lines with a thick ink, and to force paper into the lines so that the ink appears in corresponding lines upon the paper.

The artist takes a copper plate and covers it with a thin layer of wax. He draws a picture upon this film of wax with a needle, cutting through the wax to the copper. He then puts the plate into a bath of acid, and the acid, kept from the plate wherever the wax remains, finds the places where the needle has cut through the wax to the plate, and there bites the lines which the artist has drawn deeply into the copper. When a print is taken with black ink from the copper plate, the picture appears on the paper. From this plate the artist can go on printing more pictures until the plate is worn out. The reader will understand that the etcher does not trouble to cut the lines into the copper. All the hard work is done for him by the acid.

So far we have been considering a copper plate, and most etchers use copper; but zinc is very much cheaper, and will serve quite as well for those who are learning. Indeed, Seymour Haden, an eminent master of the art of etching, preferred to etch on zinc rather than on copper. A fine example of his work is given on the next page.

The plates may be bought or ordered from the shops where artist's materials are sold, but those whose pocket money is limited will do well, on finding a warehouse where zinc is sold, to ask the proprietor to let them see his scrap heap. There they can select a few pieces of zinc that are not very deeply scratched, for a few slight scratches do not matter. They should ask the proprietor to trim the pieces with his shears into the shape and size that will be suitable for the sketches that it is intended to put upon them—say, five inches by four—and in this way the artist will find that he can have a number of good plates for a very few pence. The plates will not be clean and shining like the plates he would buy from a shop, but it is possible to clean them in any of the many ways that are used for the polishing, for instance, of bicycle handle-bars or of the kitchen fender.

These plates are better, for another reason, than the plates, shining like mirrors, that the artist buys from a shop—because a beginner is afraid to spoil such handsome and costly plates, and, being nervous, he does not do his best. The plates from the scrap heap are so cheap and so plentiful that no one need fear to spoil a few in obtaining a mastery of the process.

Those who live in the large manufacturing cities such as Birmingham, or in the Yorkshire cities and towns, will have the best chance of buying their plates in this way; and if they should happen to have a friend in silver works, or in similar manufactories, who could have the plates buffed or polished, their zinc would then be quite as shining as the zinc plates that come from the shops, though the additional outlay would amount to only a few pence.

The next step is to cover the zinc with the waxy substance which etchers call "ground." The ground may be bought for a shilling a ball, but those who will take the trouble to make it for themselves may make it at a very much smaller cost. The ingredients for a very suitable ground are—white wax, one and a half parts; Burgundy pitch, two parts; asphaltum, three parts. All these may be bought from a chemist in ounces, twopence an ounce except the wax, which is generally threepence an ounce.

The asphaltum should be reduced to powder, and then melted in an old saucepan over the fire, or an earthenware vessel may be used in the oven. The asphaltum should be melted slowly, and great care must be taken not to burn it. When it is melted, add the wax and the Burgundy pitch, and as they melt stir all three together with a stick or an old spoon. When all are mixed completely, pour the composition into warm water, and there, while it is yet soft, press it into balls, each about as large as a ping-pong ball.

Wrap one of the balls in a piece of good silk. Draw the edges of the silk together, and tie a piece of string tightly round the silk at the top of the ball.

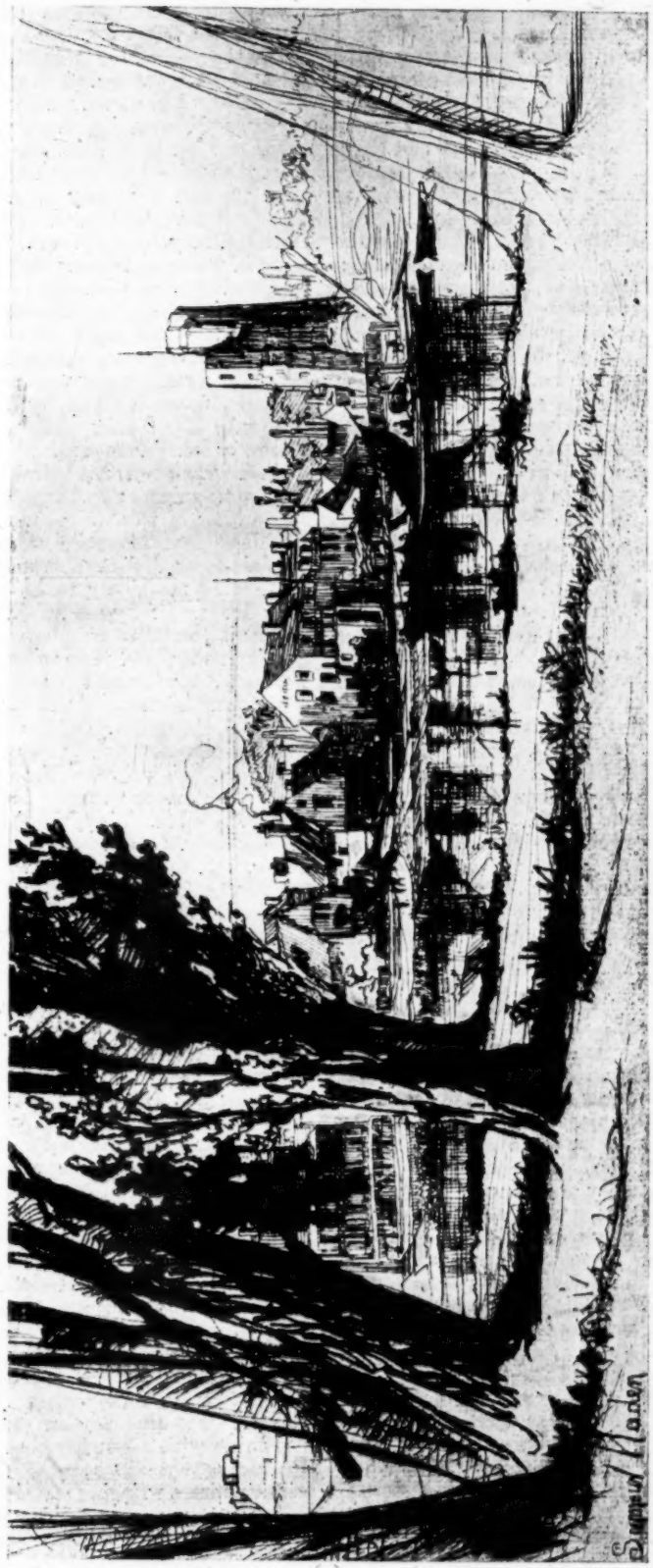
The next thing to make is a dabber. Take a round piece of cardboard, two and a half inches in diameter. Place upon this some horse-hair, and upon the horse-hair a little cotton-wool. Lay upon the whole a piece of silk, and tie the silk in the same way as the silk was tied round the ball of ground. If the etcher has no horse-hair or cotton-wool, he may use some other similar soft material for the inside of his dabber.

If there should be a gas stove in the house, the burner at the top of it will now be found particularly useful. If there is no gas stove or gas ring, a paraffin boiling stove is a good substitute; but if there is neither, then a gas jet or even an ordinary fire will serve the purpose.

When the etcher is sure that the zinc plate is thoroughly clean, he should grip one of the edges firmly with a pair of pincers, or, better still, with a hand-vice, and, holding it, he should heat the back of the plate gradually over gas stove, oil stove, gas jet, or fire. The ground should be pressed upon the face of the plate at the same time, and when the plate is sufficiently hot the ground will ooze through its covernig of silk and will flow upon the plate. The ground should be moved rapidly and deftly all over the surface until the plate is evenly covered. Then, to make the ground still more even, it should be dabbed with the dabber. If the plate is made too hot, the ground will be burnt and will give trouble hereafter by flaking off the plate. So long as the plate is hot enough to cause the ground to ooze through the silk it need be made no hotter.

When the plate has been covered thus with an even coating of ground it should be warmed again, very gently, until the ground softens and shines. Then, before the ground has time to cool, the plate should be held face downwards over the flame of a candle or of a bundle of wax tapers to smoke the ground. This process must be done quickly, the etcher never allowing the candle flame to rest in one place for a second, or he will burn the ground. This smoking of the ground, if properly performed, will result in a black, shining surface, for the smoke should have become incorporated with the melted ground.

The back of the plate and the edges, together with any part that may have been scratched accidentally, should now be painted with Brunswick black. This should be allowed to dry thoroughly, and as it sometimes dries slowly, it is best, though not necessary, to prepare the plate at least the day before it is intended to use it. For other reasons, too, this is better, because when the plate has been prepared upon some previous



"FULHAM" (1859). BY SIR FRANCIS SEYMOUR HADEN.
(Photo by W. Rice.)

day the etcher comes to his drawing without having tired himself already with preliminaries.

The zinc is now protected on each side and upon its edges, so that if it were to be put into a bath containing acid, the acid would not be able to reach the metal.

Now the best etchings, with their very fine lines and very dark lines, and all the degrees of dark and light between those extremes, are so complicated that at first the etcher should draw as though he were using a pencil or a pen, getting his dark parts by drawing more lines or by using a blunter point. Special needles are sold for etching, some of them costing a guinea each; but for fine work the larger kinds of sewing needles mounted in penholders are suitable, and for other work pieces of knitting needles, or wire filed to a point, and similarly mounted, will answer the purpose as well. Sometimes a hard pen may be used with effect. It is not necessary to cut into the zinc; but care should be taken to cut quite through the wax, for even a thin film has the power to resist the acid. As he draws, the artist should rest his hand upon a piece of soft blotting-paper, so that he may not scratch the plate. With a camel's-hair brush, which, like the blotting-paper, should be soft, he should clean away the little pieces of the ground which the needle will detach from the plate. Any slight mistake may be painted out with Brunswick black, and before this is quite dry the correct lines may be drawn upon it.

When the sketch has been completed it is ready for the acid bath, and the porcelain baths now used by photographers are excellent.

The acid bath for a zinc plate is composed of one part of nitrous acid to seven parts of water, and these should be mixed before the bath is needed, so that the heat which is caused by the mixture of the acid and water may have had time to subside. Nitrous acid is less powerful by one-tenth than nitric acid, and is considered to be more reliable. Seymour Haden, however, in a lecture on etching, once mentioned two baths suitable for zinc. One contains twenty-five parts of nitric acid and seventy-five of water, and the other ten parts of hydrochloric acid, two parts of chlorate of potash, and eighty-eight parts of water.

It may happen that these proportions will not be right in every case, because the acid of one chemist may not be of the same strength as that of another. Some zinc, too, is softer than other zinc. Again, the heat of the room influences the action of the acid, and where the lines have been drawn close together by the etcher the acid is more vigorous than where lines are solitary or are wide apart. When the artist has etched a few plates he will know by watching the action of the acid whether it is of the proper strength. If the acid attacks the zinc violently and bubbles boil rapidly from the lines, the acid is too strong and the plate should be taken out. Add more water to the acid, and when the heat caused by the mixture has had time to pass away put back the plate and try again. A stick that has been cut into the shape of a chisel should be used for raising the plate out of the bath. Then the plate may be gripped with the pincers, and while it is so held the acid may be washed away under the tap.

Bubbles should form steadily along the lines that have been drawn by the needle, and these bubbles must be brushed away carefully with a feather, otherwise they will protect the lines from being further bitten. If no bubbles appear, the bath is too weak, and should be strengthened with more acid, but not while the plate remains in it. If it is seen that the acid is biting upon some place where it ought not, where there is a scratch, where the ground has been burnt or is otherwise weak, take the plate out and paint with Brunswick black.

Fumes will rise from the bath, and the etcher should try to avoid breathing these, though, careful as he may be, he will inhale sometimes a little of the gas that rises from the plate; but he need not be alarmed.

At the end of twenty minutes or half an hour the plate will have been in the bath for a sufficiently long time and may be taken out. Wash the acid from the plate in water, and clean the ground away with turpentine, and then the plate will be ready to be printed.

A shilling bottle of suitable ink may be purchased from a shop where artist's materials are sold, and when the etcher has become expert he will do well to use this ink. Meanwhile, however, it is quite possible to see what his success has been by using part of the contents of a tube of oil paint—black, burnt sienna, Vandyke brown, or other dark pigment.

Then what about the printing machine? Well, that costs some guineas; but here again there is a substitute. The author of this article used his mother's wringing machine! At this point there may be difficulty in obtaining permission to promote that useful piece of wash-house machinery to be a handmaid of the fine arts; but no injury need be done to the rollers if the printer is careful to wrap the plate well in flannel and blotting-paper, and then to enclose the whole in some catalogue, for instance, or in some other paper that is of no further use. If this is not done, the hard plate will mark the rollers.

Make the plate slightly warm, and then cover it with the ink, dabbing this well into the lines with a dabber similar to the one that has been used already for dabbing the ground. When the lines have been filled, wipe the ink from the surface of the plate with a coarse duster, and be careful not to wipe the ink from the lines. Then polish the surface of the plate with a little whiting. The printers of etchings use the palms of their hands for this final polishing, and if this process has been properly managed the lines are still full of ink, though the surface of the plate is perfectly clean. The paper must not be glossy paper. Leaves from a drawing-book are generally suitable. The sheets should be damp, but not wet. If the artist has a damp cellar or outhouse he should keep the paper there, and it will be ready for use. Lay the paper on the plate, and over the paper two or three pieces of flannel and blotting-paper and other packing, as we have already mentioned.

Now let the whole pass between the rollers, and they will press the sheet of drawing-paper into the lines. In this way the picture will be printed on the paper, and the etcher will be in possession of his first etching. As soon as he has printed as many as he wishes for the present, the etcher should clean the ink from the lines in the plate with turpentine, or it will harden there, and so prevent the artist from obtaining any more impressions.

The example of an etching given on page 21 does not pretend to be a work of art, but it shows what a youth, who was not an expert draughtsman, was able to do with a rough piece of scrap zinc under the conditions that have been described, including the printing with a wringing machine.

The young etcher should wear old clothes, because every splash of acid will leave a scarlet mark on cloth, and no matter how careful he may be splashes will

come sometimes. All etching should be done away from good furniture and carpets, and all the time there should be near to the etcher a bowl of water, so that if he splashes his hand with acid he may wash it off immediately. If he likes he may protect his fingers, or the ones likely to touch the acid, with grease. Acid left on the skin causes a yellow mark difficult to remove at the time, though it disappears in a few days. The bottles in which acid is kept should have glass stoppers, for acid eats the cork away.

Remember the drawing will be reversed by the process, and thus if it is desired to copy a picture the etcher must not copy it directly. Place the picture before a mirror, and then draw from the image in the mirror. It is useful to know that if a plate is re-covered with ground when there is a drawing on it, it is still possible to see the lines of the drawing through the ground. In this way an etcher may alter and correct the drawing on a plate. The etcher should not try to imitate the elaborate work of steel engravings. The work of the best etchers is usually simple, containing only the most essential lines. If the learner has not access to etchings by Rembrandt, Whistler, Seymour Haden, Geddes, and Pennell, he may be able to find pen-and-ink drawings by Pennell or Railton in magazines or in other books, and by a very careful examination of the lines these artists have used he will gain much very valuable assistance. There are times when the young etcher will find a magnifying glass useful to examine his work.

The etcher should paste a print from each of his plates in a book, and should write under the print his experiences in etching the plate—the proportion of acid and water that he used, the time that the different parts were allowed to remain in the bath, the heat of the room, and other particulars of the process. The acid that has been used for the etching of a plate will serve to etch a number of plates, but it becomes weaker each time, and a little fresh acid should be added to restore it to its proper strength. It is because of this need that the etcher should learn, by watching the plate in the bath, to know whether the acid is of the right strength, because rules cannot be given for this addition of acid.

The etcher generally sits with his face towards a window, and he fixes between the plate and the window a frame upon which has been stretched a sheet of white tissue paper. This is not a necessity, but it will prevent the sparkle of the lines upon the zinc from dazzling the etcher's eyes. This sparkle, it should be remembered, causes the lines to appear nearer together than they really are. Thus if the etcher wishes to do fine shading he will need to do it very finely, for it will look less fine when a print is taken upon paper.

When the artist has gained more skill, he may attempt a more complicated drawing. He can first trace it on tracing paper, and then, by covering the back of the tracing paper with red or white chalk, he can, with an ordinary lead pencil, transfer the drawing to the ground on the plate with sufficient distinctness to be able to follow the lines with a needle.

When the drawing has been completed with the needle, the plate should be put into the bath, and when it has been there for five minutes it should be taken out again and washed, and the lines which the etcher wishes to be faint should be painted over with Brunswick black. This will prevent the acid from biting them any deeper. The plate may be put back in the acid now, and when ten more minutes have passed the next lightest parts should be painted with Brunswick black. In this way the etcher may have some of his lines bitten for five, ten, fifteen, twenty, twenty-five, or thirty minutes as he wishes, and may thus have many degrees of darkness in the lines of the drawing.

Etching is a process with principles opposite to those involved in the printing from wood blocks and zinc blocks used in the illustration of this magazine. The pictures in the *Practical Teacher* are from blocks on which the lines stand up from the rest of the block, and thus they can be printed at the same time and by the same printing process as the type. In the etching, as we have seen, the lines are sunk below, and they need to be printed separately.

The etcher should not be discouraged if he fails to grasp all these directions in a day. If he perseveres, the knowledge will come to him, not all at once, but little by little; and if he cares to pursue the subject further, he will find a very fascinating literature awaits him in the writings of Philip Gilbert Hamerton, of Seymour Haden, and of others, and he will look with added zest upon the masterpieces of Rembrandt, of Méryon, and of the rest of the world's notable exponents of this alluring art.

THE ROYAL DRAWING SOCIETY.

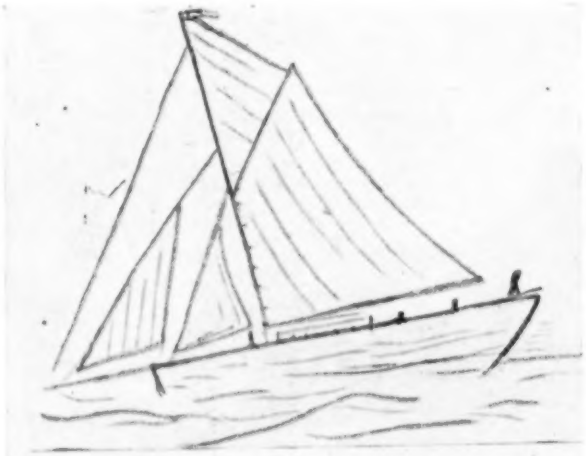
DRAWING EXHIBITION, 1909.

THE twentieth annual exhibition of the Royal Drawing Society was held at the Fishmongers' Hall, London Bridge, during the first week in May. A large and varied collection of children's drawings was on view. These were mostly done in the schools, both public and private, and other educational institutions where the well-known "Ablett" system of drawing is followed. It is just ten years ago since I last wrote in *The Practical Teacher's Art Monthly* on the useful work done under the supervision of the Art Director of the Society, Mr. T. R. Ablett, whose life work it has been to organise and encourage the rational teaching of drawing in elementary and secondary schools,* and to whose untiring efforts in this direction the teachers and scholars owe so much. The annual exhibition at that time was a comparatively small concern, and was held at the studio in Queen Anne's Gate, which is now used as the offices of the Royal Drawing Society. "The Children's Academy of Art," as I then termed it, has grown wonderfully during the last decade, and I noticed that the juvenile contributors to the present exhibition are not confined to the British Isles. Drawings are sent to be judged by the experts of the Royal Drawing Society from various European countries, as well as from our own colonies. The annual exhibition of drawing is intended to afford boys and girls who have conspicuous ability for drawing an opportunity of executing work which cannot be done under examination conditions, and of measuring their capacity with the specially gifted pupils of other schools or classes. This seems to be much appreciated by the parents and teachers of these budding artists, and is easily understood when we consider that every drawing sent in is judged entirely on its own merits by artistic and yet sympathetic judges, who are experts in their own particular branch, and whose verdict can be relied on as being thoroughly impartial. To be the fortunate winner of an award, particularly of the gold or silver star of the Society, or the special awards of various artistic patrons who are interested in the teaching of drawing done in the schools, is therefore a distinction to be proud of, and is highly valued by both teacher and scholar.

The one thing that struck me as being a conspicuous feature of this year's exhibition was the prominence given to the training of the memory in form and colour. Some of the best work shown was that done as memory sketches. Indeed, "snapshot drawing," as it is termed, seems to be the most popular form of drawing done in the classrooms of those schools where the Ablett system of drawing is followed.

It is generally admitted that the memory in youth is far more retentive than in later life; and if this be true of exercises in literature, where hundreds of lines from Shakespeare and other standard poets are memorised with little difficulty, why may it not be equally true when the study of form and colour is being taken up? I have been struck with the well-known fact that a child often makes a more effective drawing of an object from memory than when the same object is before him, when he is at liberty to measure its proportions and carefully examine its details. This may be explained by the fact that a too minute study of detail, though doubtless very necessary at times, tends to confuse and take away the power of grasping the general shape of the object.

The clear mental image which it is so necessary to secure, the *impression* which must be received before the *expression* of the same can be put on paper, becomes blurred with overlapping and overcrowded details. A young child will invariably put in a multitude of minute veins in an ivy leaf while the general shape is entirely wrong. Any system, then, which aids in suppressing detail and brings the general shape and proportions into prominence is to be welcomed. If a minute and a half or two minutes only is the time allowed in which to get a general impression of the form and colour of an object,



Seen from our window
J. Wood 8. St John's, Walmer

This is our cat which I see nearly every day, it lives in London.
J. B. S. Mackail 9.9. Froebel Educational Institute, Kensington

* Mr. Ablett was for some years organiser of drawing under the late School Board for London.

there is no time for the study of minutiæ, and a clearer mental picture may be thus obtained. In criticising such snapshot drawings it would, of course, be unfair to expect the careful representation of detail; if the expression and general look of the thing is caught, that is all we should expect.

The most interesting exhibit to me was a large screen showing the gradual development of children's drawings from the earliest age. This was labelled, "The Revival of Youthful Art League."

One sees here, among other things, the great and increasing interest which is being taken in the subject of drawing by parents and others outside the school walls. Drawing is being thought about quite seriously by the cultured parent of to-day in its relation to the early training of the intelligence. It is now regarded as an essential factor in education. The apparently aimless scribble in blue and red chalk by a child of two and a half years is shown as the earliest indication of future artistic ability. No one but the fond and partial parent may be able to discern a likeness to anything material, but the fact that the efforts of the baby to express itself in line and colour is thus recognised at all is a significant one.

At the age of three an attempt is made to draw some snowdrops. In this we see some faint indications of the perception of form in the shape of the mass which represents the petals. A four-year-old child is ambitious enough to attempt to draw a man crying. Here we see the common notion of the arms (shown as thin straight lines) being placed at right angles to the body, with the fingers outstretched like a toasting-fork.

At the age of five the glowing colours of a velvety pansy attract the child, and an irregular mass of purple and yellow paint shows his first crude attempt at mass drawing in water colours. Naturally, there is no suggestion of separate petals. At five and a half years we see a child's idea of Robinson Crusoe after seeing that skin-clad individual at the pantomime. At the age of six, a drawing from imagination of a girl skating is shown. This is drawn directly with the brush. The arms of the figure are thrown wildly upward, and look like uprooted trees where the roots represent the fingers, showing the difficulty experienced by the child in the use of the soft and yielding brush point. The cap flying off suggests a sense of motion. At the age of seven something simpler is shown by the drawing of an apple, which has distinctly good shape and colour; even the light and shade are suggested with fair success.

A little fellow of eight is so interested in cricket that he tries to show his idea of a group of five boys engaged in playing the national game. It is drawn in pencil and tinted. At the age of nine the drawing of a jay and parrot from life has been so well executed that it has been awarded the bronze star of the Society.

The figure of a lady taking a walk was sent by a boy of ten, and was drawn in coloured crayons. It showed a decidedly good sense of proportion.

At the age of eleven we see the observation of a child who was attracted by the sight of a negress waiting at a railway station. She carries a big umbrella, and is surrounded by luggage. Altogether a bit of intelligent memory drawing.

R. S. Austin (aged twelve) well deserves the bronze star he has obtained by his painstaking pencil studies of the figure from life. Above the age of twelve the result of all this preliminary training naturally resembles the work done at our schools of art, but often with a sense of freedom and spontaneity and with a simplicity of colouring which is wanting in more academical studies. Margaret Inge (fourteen) shows very rich colour in the difficult study of a plate of strawberries, while Sybil Stewart (thirteen) gives us a capital painting of flowers very delicately treated. Some remarkably good drawings of dogs are shown by Dorothy Knight, the collie and sheep-dog being particularly well rendered. The excellent result of the training of the memory is shown by an important sketch from memory of three horses in a ploughed field. Two of the animals are shown in very difficult foreshortened positions. This drawing obtained recognition by the award of a bronze star. The G. F. Watts "In Memoriam" prize was awarded for an original pen-and-ink illustration representing a sailor with a wooden leg pushing a fish barrow.

It is a distinguishing feature of the work done under the auspices of the Society that the study of the human figure is encouraged from the very earliest age. In the words of its prospectus, it "allows each child to develop naturally in observation, thought, and manipulation, and to be an original pictorial artist from the very commencement. Furthermore, it suggests that early study may be based, like fine art, in the careful observation of our fellow-creatures."

The children are taught not to be afraid to tackle a hand, a foot, a face, or a complete figure. A little lad of seven, for example, sends a drawing which he calls "Myself," as seen in a hand-mirror. A girl of nine, living at Winnipeg, sends some illustrations of nursery rhymes. The best is that of Peter Pan, looking very contented and happy riding on the back of a bucking goat.

A clever little artist of fifteen is Zsofia Kayser of Buda Pest, who sends in a snapshot of children sketched in pencil, the admirable drawing of a curly-headed boy in a sailor suit being particularly pleasing. But it must not be thought that snapshot drawing and memory sketches of figures occupy all the attention of the scholars.

The drawing from common objects, in pencil, crayon, or with the brush, forms an important part of the course, while the most careful drawing from nature is wisely fostered. Thus a most useful exercise in foreshortening is shown by the pupils of Ivydene Hall, Malvern. It consists of a set of ordinary playing cards, which are drawn in all conceivable positions, sometimes lying about in careless profusion, and sometimes built up as card castles of complicated design. This exhibit was awarded a silver star. From the same school we see drawings of such objects as an armchair, washstand with jug and basin, an ancient cabinet full of old china, and a grandfather's clock, all drawn with neatness and accuracy in pencil and tinted in colour. Among the nature studies of very young children I was struck with the work of a child of seven—a turnip and mushrooms—which was exceedingly well executed. Much careful work from plants, shells, insects, stuffed birds, and other natural objects was shown, the details being in many cases worked out with the most painstaking diligence. Thus I noticed the study of dragon flies drawn apparently from a museum case, where the insect was not only drawn in many different positions, but showed the dissected parts, much enlarged and correctly named, thus making not only an artistic but a scientific study at the same time.

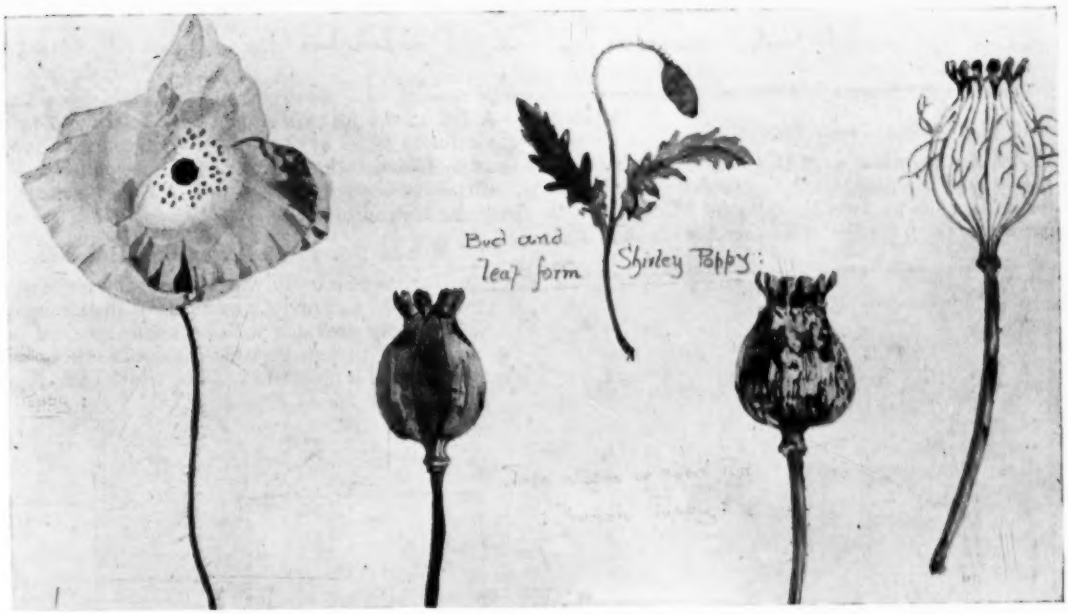
I have been able, by the permission of the Council of the Royal Drawing Society, to reproduce memory drawings done under examination conditions by children under twelve years of age at the recent annual examination. The subjects are of the candidates' own selection, from something seen by them at any time. They have to state where the object was seen. The drawings show in a marked way the value of early training of the power of observation.

C. E. Belsten.

HONOURS PAGE.

1. Jeanie Wilson, Newnham House School, Ayr.
2. Annie Maud (13), Boothferry Road School, Goole, Yorkshire.
3. John Adams (12), Haugh Shaw Council School, Halifax.
4. William Boyer (13), Mantle Road Council School, Leicester.

No. 1 was a very delicate study in colour of the Shirley poppy. No. 4 was a bold charcoal study. Nos. 2 and 3 were both in colour.



HONOURS PAGE.

CARDBOARD MODELLING.

BY FELIX T. KINGSTON, BARRY.

Model No. 7.—A Sloping Tray.

THE main dimensions here (Fig. 11) have been purposely kept the same as in the preceding model, in order that the child may see the different effect produced by lengthening the top edge. Compare the line XX (Fig.

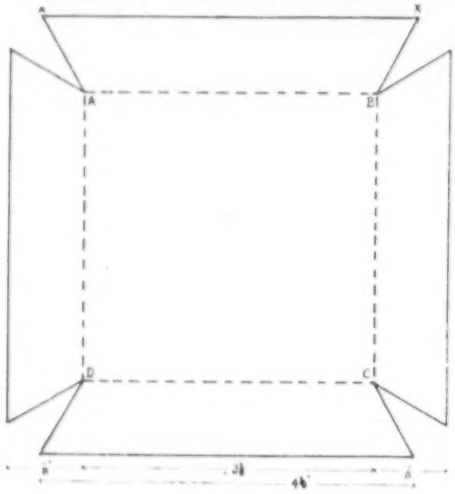


Fig. 11.

10*a*), $3\frac{1}{8}$", with XX (Fig. 11), $4\frac{3}{8}$", the result being to change a perpendicular into a sloping face.

Follow the same order in drawing, scoring, fixing, etc., as in the preceding model. The chief difficulties arise in connection with the various angles at which binding strips have to be mitred. These difficulties can be surmounted easily by cutting each strip to exact length, folding it, placing in position, and marking with pencil the amount to be cut away as waste.

A few of the forward pupils may be allowed to bind the interior edges of the tray, in which case the cloth must be folded with the gummed surface *outwards*.

Either or both of Nos. 6 and 7 may be made rectangular instead of square.

Model No. 8.—A Match-Box Holder.

It will serve as a useful variation of the mode of procedure adopted in previous exercises if in this case the pupil be simply provided with an undimensioned drawing and asked to find suitable dimensions from actual measurement of a match-box. The width (AB, Fig. 12)

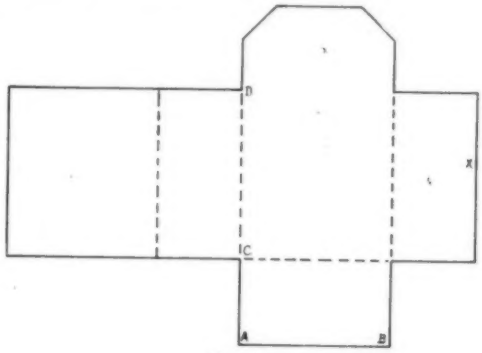
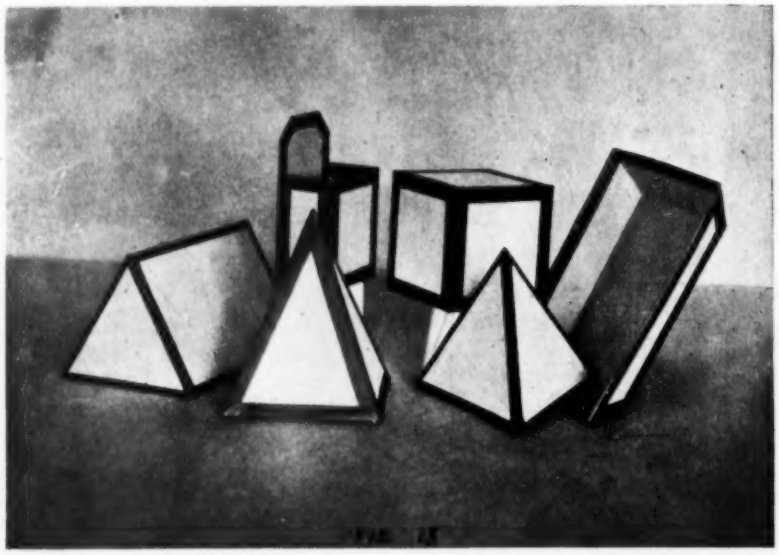


Fig. 12.

and depth (AC) must allow of the match-box slipping easily into the holder, while the height (CD) should allow part of the box to project above to enable it to be gripped with ease.

Make sure that the pupil understands these conditions, and then throw him on his own resources. Metric measurements will, perhaps, be here more suitable than English. Each child will submit a sketch-plan for approval before commencing work.



When fixing, begin with the edges marked X (Fig. 12), and next with AB. The remaining edges may be bound in any convenient order.

Model No. 9.—A Cube.

The development is shown in Fig. 14*a*. Note that the square A may occupy any one of four positions along the top and bottom of the figure. As this is a closed model, flaps (about ¼″ wide) will be necessary for fastening it together. Parts of the ends of flaps must be cut away where necessary, to prevent their overlapping when the cube is bent into position. When fixing, begin at X, allowing the joint to set thoroughly before fastening the others. Bind the edges in the following order: first the four edges marked *a*, then the four marked *b* (Fig. 14*b*).

The square prism may, if preferred, be taken as an alternative to the cube, the development being obtained by simply lengthening the lines marked *a* in the figures.

Much greater accuracy is necessary in drawing, scoring, and fixing geometrical models of this kind, because errors are more readily perceived on account of the symmetrical rectilinear nature of the objects; the slightest deviation of a straight line or plane surface is easier for the child to detect than an error in a curved line or surface.

This model, and the three immediately succeeding, may be constructed to scale from actual measurement by the pupil of the drawing models which find a place in every school, thus combining the work closely with the scale drawing of this standard. The models may also be connected with science lessons dealing with crystallisation—for example, common salt crystallises in the form of cubes. Or, again, these geometrical solids may provide the bases of much arithmetical work—for example, the calculation of areas and volumes, or of quantities of materials used in construction.

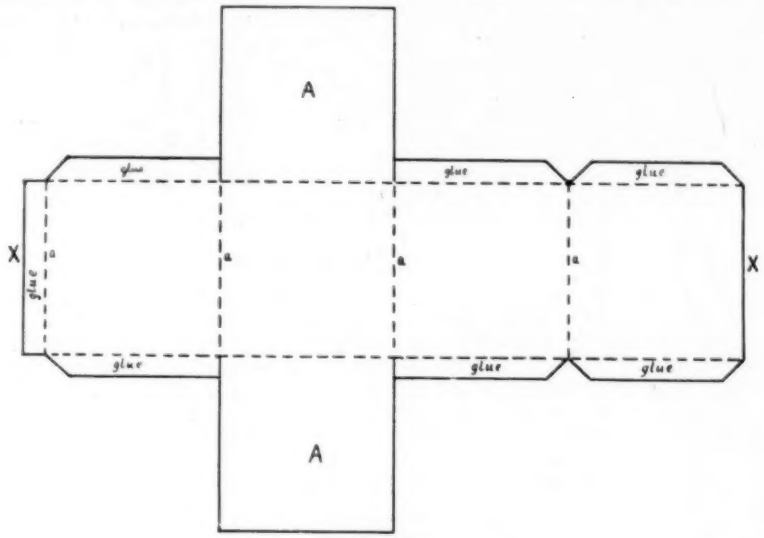


Fig. 14.

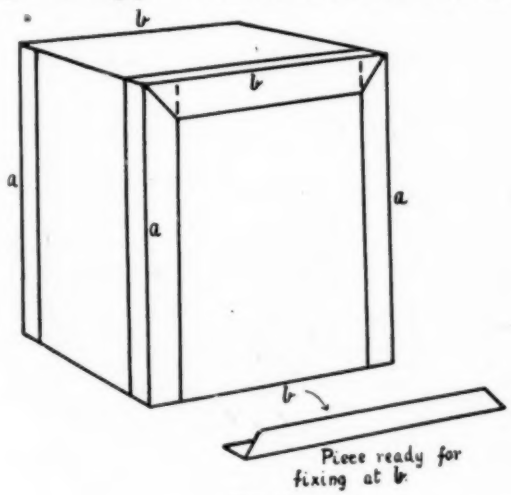


Fig. 14*b*.

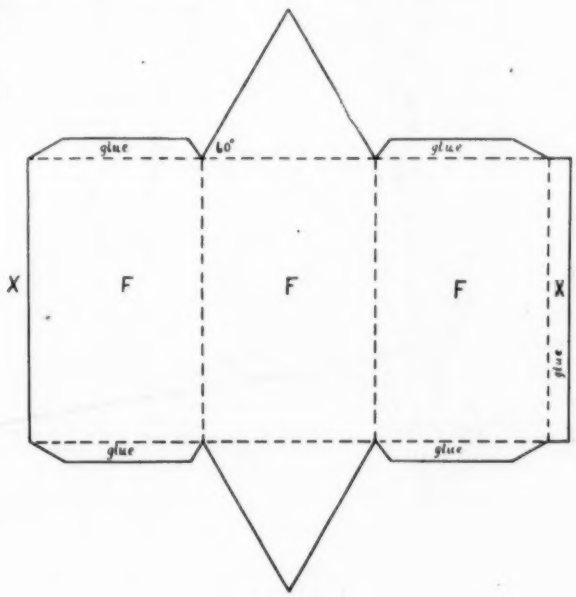


Fig. 15.

In schools where children of this standard are familiar with decimal notation, the dimensions of some of the models should include tenths of an inch or tenths of a centimetre.

The construction of geometrical solids will give the child a sound knowledge of form, inasmuch as the only way to know form is *to make it*; the learner must receive sense impressions through the hand as well as through the eye.

Model No. 10.—A Triangular Prism.

To be bound and covered. The development is shown in Fig. 15. Note that the triangle may occupy any one of three positions at the top and bottom of the figure. As before, cut away enough of the adjacent ends of flaps to make them lie side by side when the model is in position for fixing. When gluing, begin with the edge marked X, afterwards proceeding with the two corresponding long edges. After binding all the edges, cover the sides and ends with covering paper of suitable colour, allowing about half the width of the binding to show round the edges.

In making this model pupils should be thrown largely on their own resources, for the drawing is but a slight variation of that required for the cube.

Notice that by increasing the faces marked F to six in number, and substituting a regular hexagon for the equilateral triangle, we obtain a regular hexagonal prism; and so on for other kinds of prisms.

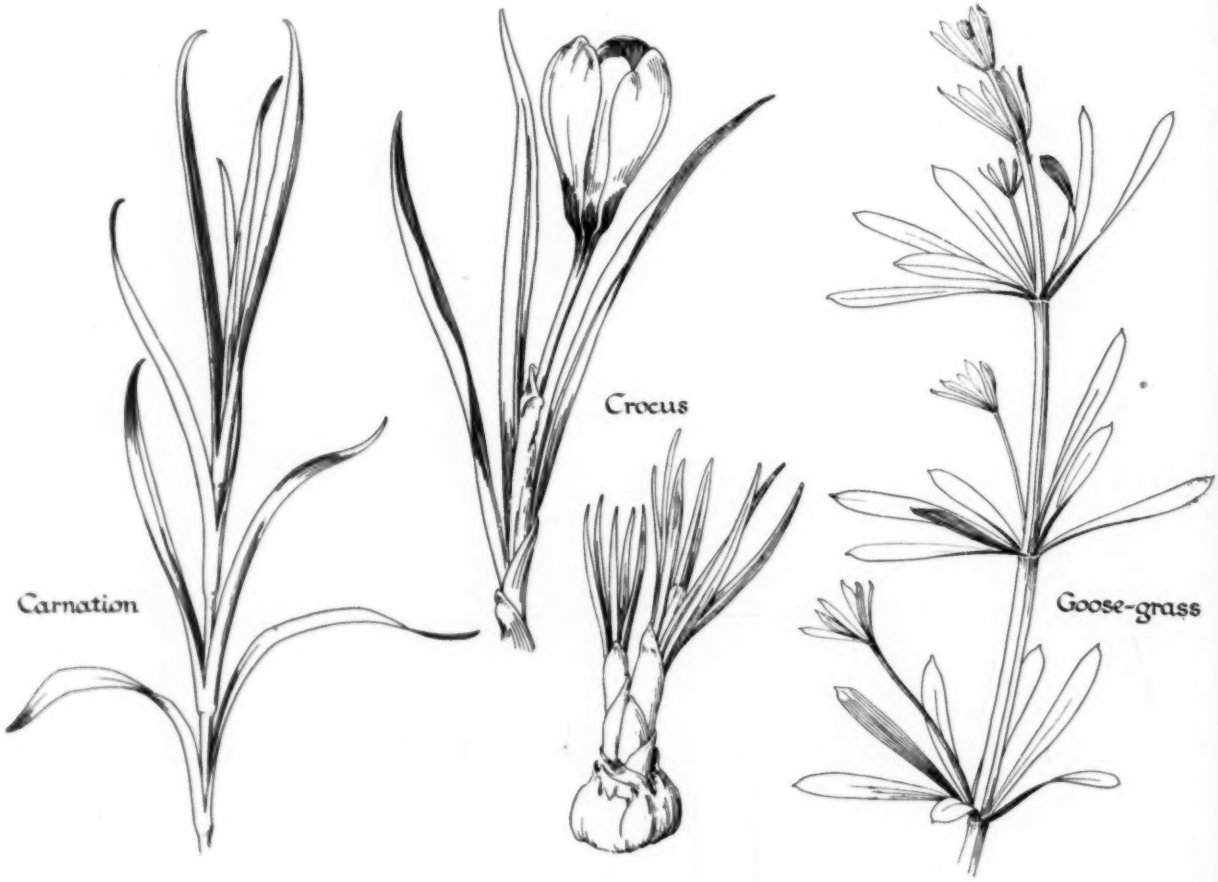
(*To be continued.*)

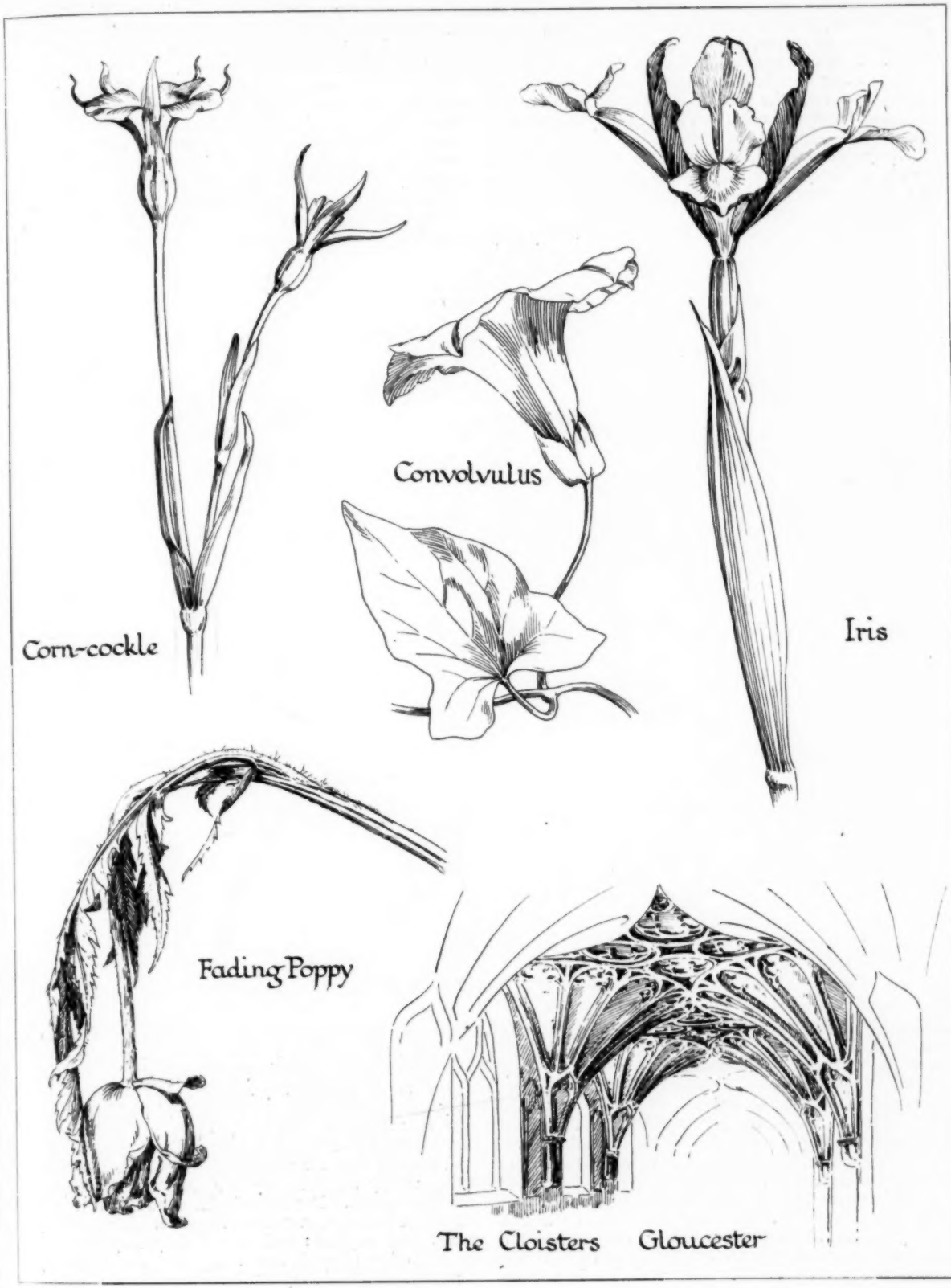
THE MEANING OF LINE.

BY AGNES FARMAN, LEICESTER.

LINE is the language or method of expression by which we convey our ideas of the form of things. Line is not merely accurate form; the spirit of it is the essential part, and it is this latter which is so often missed.

Nature's lines are full of life and movement at all times, and perhaps especially in the spring, when all growing things show by the direction of their curves the living force that is in them—the continuous pressure from below upwards which gives an onward and forward movement and a gradual spreading out towards the sun and light. This movement is particularly evident in the groups of lines formed by the ribbon-like leaves of the spring flowers as they escape from their enclosing sheaths, but is a general characteristic of all opening leaves and flowers. The drawings below illustrate this. The builders of our cathedrals and churches have felt the beauty of this springing line, and have made it a noticeable feature of the vaulting.



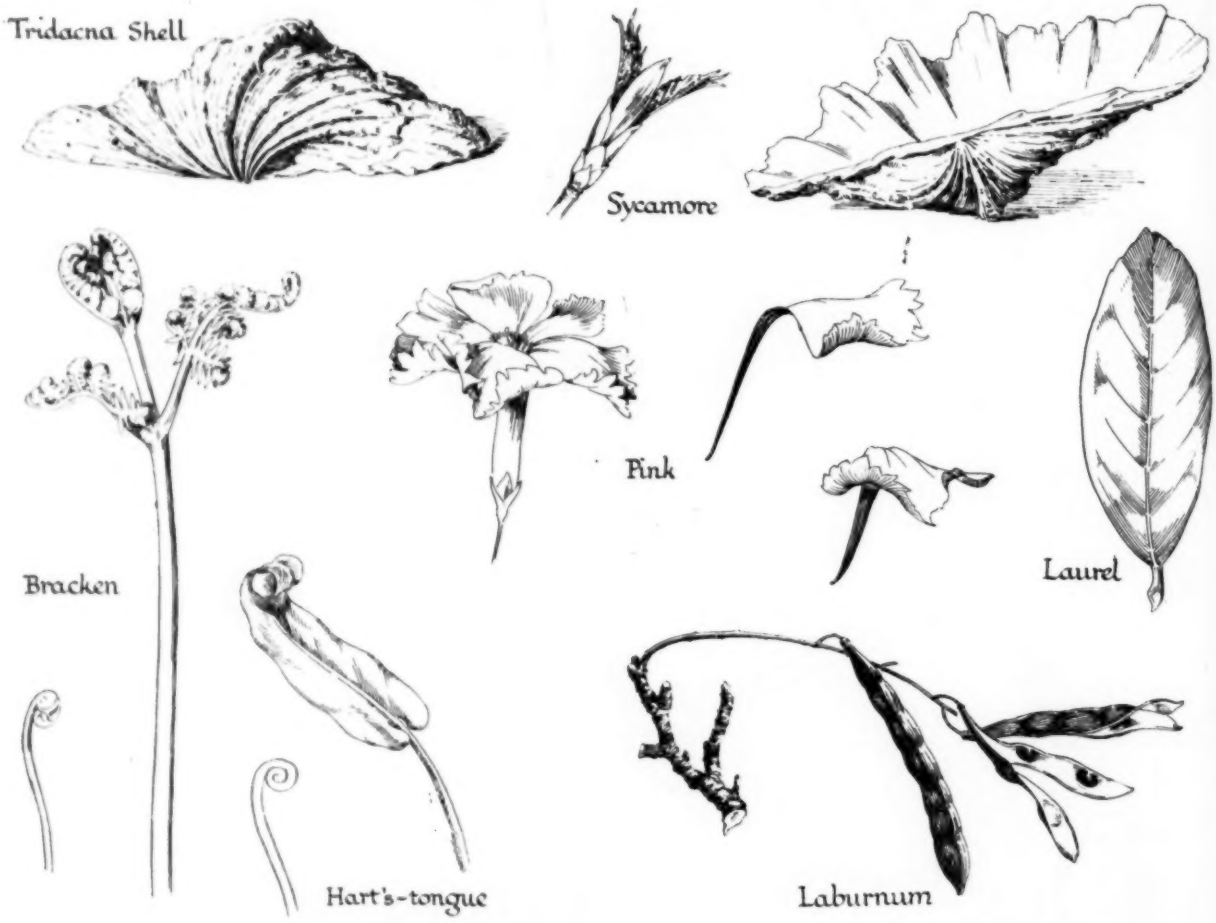

Corn-cockle
Convolvulus
Iris
Fading Poppy
The Cloisters Gloucester

Children will perhaps not appreciate these lines at first, but they should be shown that they are not merely boundaries of shapes, but express also the life of the plant. A comparison between a newly-opened flower and a fading one, in which the vigour of growth has disappeared from the lines, may make this clear, as, for instance, between the iris and faded poppy in the illustrations.

Every line should have a meaning, and none should be put on the paper merely for the purpose of covering it; these useless lines are too often allowed to spoil a drawing otherwise well begun.

Lines should be as descriptive as possible: they may be bold or fine, broken or continuous, according to the nature of the thing represented, and there should be continual variation in them. Every texture or variety of surface needs its own kind of line: the outside of a rough shell requires different treatment from the smooth inside, the seed-pods of the laburnum from the twig to which they are attached, or the crumpled leaves of the sycamore just coming out of the sheath from the protecting scales which enclose them. The young shoots of trees are smoother than the rough bark of the older branches, and some leaves have an almost glossy surface, as the holly or laurel; whilst others are dull, and others, again, are roughened, as those of the faded poppy on page 29. This variation in texture does not apply only to natural objects; a book that has been much used must be expressed differently from one that is quite new.

Lines should be full of feeling. Nature is full of curves of the most subtle, beautiful, and inexhaustible variety, and these should be carefully studied, with all their modulations, in order to give character to the thing drawn. Strong, vigorous parts have little curvature, the weaker parts lean more to one side or the other. In the change from a nearly straight line to a sudden curve we find some of nature's most living and vigorous lines, as in the fern fronds and the petals of the pink given below, and in some tendrils, as the bryony on page 31.



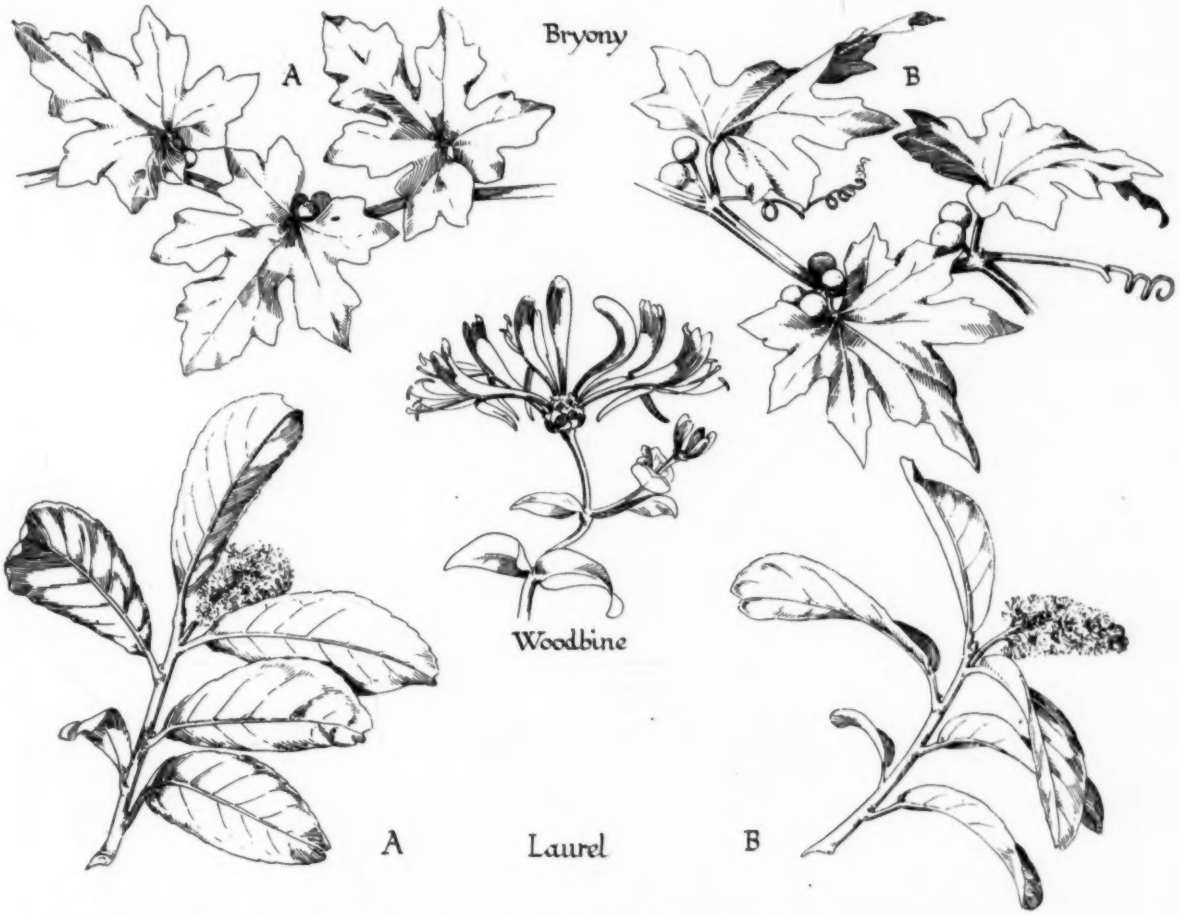
Broadly speaking, there are two kinds of line—the straight and the curved. The curved may be divided into those which are definitely geometric and those which constitute no part of any geometric form, but which may approach the circle on the one hand and the straight line on the other, with every degree of modification between them. It is the geometric lines, both straight and curved, that are the foundation of manufactured things; they are necessary to ensure the stability of man's creations. But nature's lines are full of movement and freshness, even when there is need for stability and strong support; and though they may give the general effect of straightness, they will, when carefully analysed, as Ruskin says, "hover about a straight line

nearly coinciding with it, but never losing the curvilinear character." These more subtle curves of nature are far more beautiful than the geometric ones.

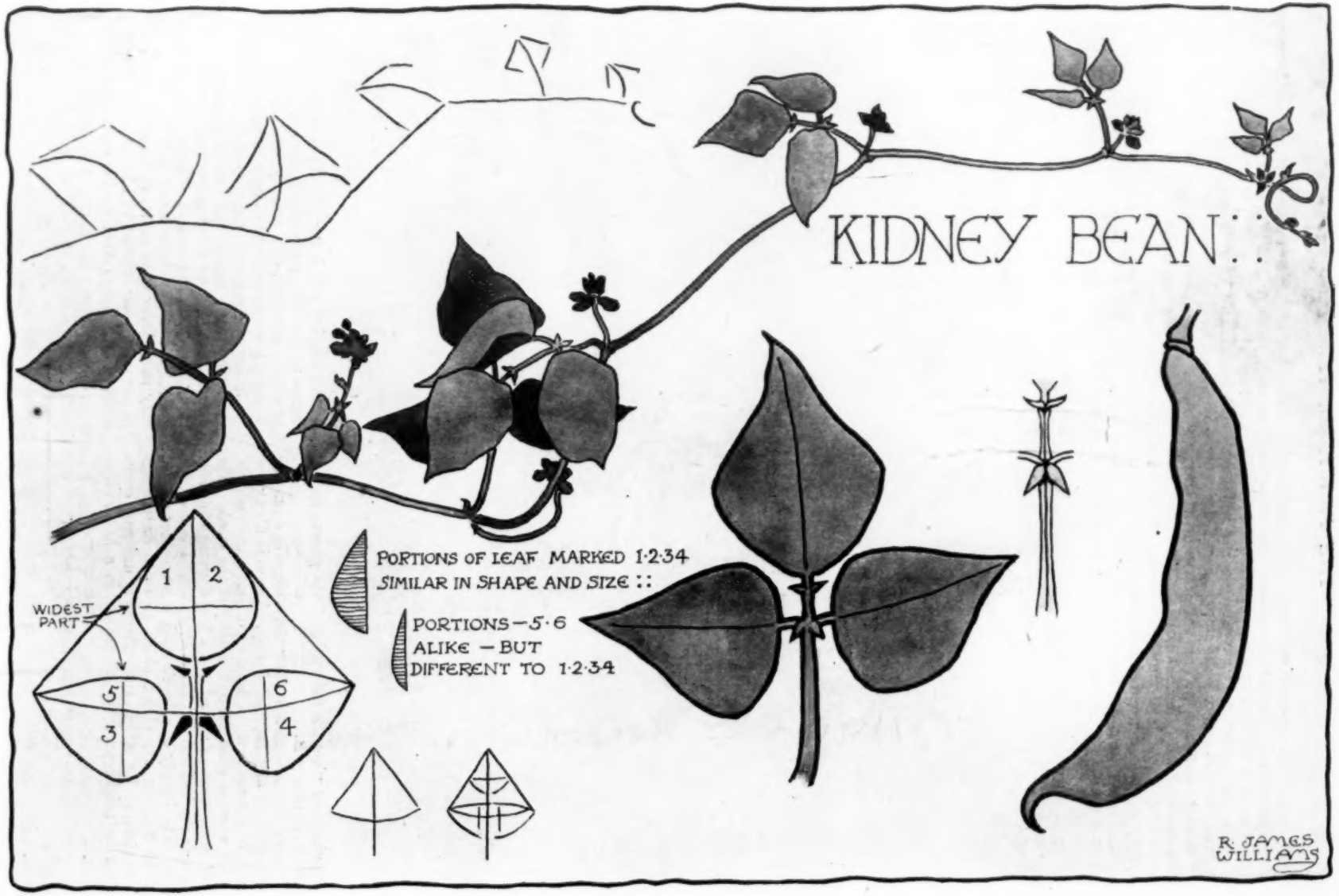
Again, the radiation of curved lines is much more beautiful than the radiation of straight ones. This may be seen by comparing the lines of a fan with the curves of a scallop shell. The Tridacna shell on page 30 is another fine example of curved radiation. If we look directly down on a group of leaves, seeing only the plan of their arrangement, as in the bryony, Fig. A, given below, we find that the beauty of the curves is not half so evident as when the full spring of the growth lines is visible, as in Fig. B.

These illustrations also show that things in nature do not grow in any haphazard way. There is always an orderly arrangement, a balance of one part with another which is essential to the unity of the whole. The difference between a good and a bad drawing is usually that in the bad one this harmony of lines has been left out. The beauty of a bird's wing is altogether marred if the feathers are pulled about so as to disturb the arrangement by which each shows a different curve from its neighbour, while all radiate in a harmonious succession of lines. Unless this relation between the parts is preserved, there is a feeling of incompleteness and unrest.

The principle of radiation cannot be too strongly impressed in all nature drawing, for it is found everywhere. The woodbine or honeysuckle is an excellent example of a group of lines in which each one re-echoes the other, but with perpetual variety. In a flower or leaf spray every change of position will bring a new series of curves into view. The branch of laurel (A) shows a simple arrangement of lines springing from the main stem, but if it is turned till the front of the leaves begins to show (B), a new combination of lines is at once apparent, although the same general law is evident. When it is twisted still more, another series will appear.



The knowledge gained, not only of the character of the particular plant, but of the lines and laws of natural growth generally, by drawing several views of the same spray is seldom realised in schools. If the children grasp the fact that in order to draw a thing properly they must know it in all its different aspects and not in one only, their interest will be rather increased than lessened by making several studies of each subject.


KIDNEY BEAN::
PORTIONS OF LEAF MARKED 1·2·34
SIMILAR IN SHAPE AND SIZE ::
PORTIONS—5·6
ALIKE — BUT
DIFFERENT TO 1·2·34
WIDEST PART
1
2
3
4
5
6
R. JAMES WILLIAMS

NOTES AND SUGGESTIONS ON THE TEACHING OF EXPERIMENTAL SCIENCE, MATHEMATICS, AND DRAWING.

BY C. HAMILTON.

(*Continued from page 648.*)

OUR two next articles contain Sections V., VI., VII., and VIII., dealing with area of plane figures. The geometrical investigations, of which several very important ones will be found in the examples, will lead to algebraical statements of the rules for area. It is perhaps hardly necessary to caution the teacher against permitting the rules to be inferred from the consideration of one or two examples. In this, as in all similar cases, time is saved, and a broad and comprehensive "presentation" is secured, by distributing the work among the members of the class. There is very little advantage to be derived from either one student accumulating a large amount of experimental data, or the whole of the class working at an identical figure. So long as the figures to be measured and the results to be obtained are similar, the number of figures of different sizes drawn and measured should be at least as great as the number of students in the class, while it may be five times as great. It is, however, of the highest importance that the whole of the experimental data should be tabulated on the blackboard and entered in each student's book before any attempt is made to draw the conclusion. The argument will then be, "If this is true within the limits of experiment for so many cases, it is probably true for all." It should further be borne in mind that the correct solution of every subsequent problem by means of the formula is an additional proof of the validity of the law.

The practice of dividing the work among the class in this way has something to recommend it beyond the results mentioned in the foregoing paragraph. It tends to develop responsibility. The student is not merely seeking a numerical result that can be verified by looking at the end of a book, and for an error in which he alone must suffer. He is concerned in a joint investigation, and for the accuracy of his work he is responsible to each and every member of the community to which, for the time, he belongs. This communal interest makes all class teaching more stimulating than individual tuition.

It will be observed that in some of the examples an exact numerical answer of the same value for every student is not required. A very large number of practical everyday problems either cannot or do not need to be solved by mere arithmetic; they require to be dealt with in the light of common sense, experience, and judgment. Exactitude out of place is pedantry. It is hoped that the introduction of such problems will not only give the pupil a clearer notion of the value of mathematics in the ordinary affairs of life, but also, without destroying his conscientiousness, lead him to be more observant in his work, quicker and more intelligent in his methods, while at the same time he builds up a valuable and approximately quantitative experience of quantity and cost of materials and labour which will be of infinite value to him in after life.

Section V.

The foregoing sections have covered sufficiently the ground of linear measurement. Before proceeding to consideration of the area of plane figures, it is necessary to develop clear notions of angular measurement. It is, of course, quite possible that in some evening schools the student will be fairly familiar with this part of the subject. In that case the purpose will be revision and extension.

Let the students draw two lines perpendicular to each other (*a*) by paper-folding, (*b*) by geometry. Show the equality of the angles thus formed by superposition. Introduce the name right angle.

Let each student draw a circle and two diameters at right angles. Explain angular measurement (*a*) by division of a right angle, (*b*) by the notion of a rotating line. To explain the latter, let a piece of tracing-paper be fastened over the circle by a drawing-pin passing through the centre. If one of the radii be traced on the paper and the latter rotated about the pin, each student will be able to form for himself an idea of angles greater than 180° without waiting for the minute hand of the clock to move round. He will be able to appreciate better problems on angular velocity, and will especially be helped to obtain clear notions of the variable angular velocity of a rocking lever, which is an extremely common contrivance in machine tools. Each student should construct angles of 30°, 45°, 60°, and 90°, and practise estimating angles given to him by the teacher.

Problems of general interest may be set involving distances in miles of places on the equator or on a meridian of longitude, and this forms a convenient point at which to explain the origin or foundation of the metric system.

Let the class draw circles 1, 2, 3, 4 . . . inches or 2, 3, 4, 5 . . . cms. radius, and assuming them to be wheels rotating with the same given angular velocity—that is, the same number of revolutions per minute—find how the linear velocity varies with the radius. Plot on squared paper, and find velocities for intermediate radii and radii larger and smaller than those given. Work examples connecting angular and linear velocity.

EXERCISES—DRAWING AND NUMERICAL.

1. Construct angles of 30°, 45°, 60°.

2. Bisect the given angle. Construct angles of 15°, 22½°, 37½°, 52½°, 67½°, 75°.

3. What is the angle between the hands of a clock at 2 o'clock, 5 o'clock, 7 o'clock, 11 o'clock, 24 minutes past 2, 20 minutes to 10, a quarter past 3?

4. What is the angle turned through by the minute hand of a clock between 2 o'clock and 4.15?

5. A clock loses two minutes per day; what is the loss per cent.?

6. What is the angular velocity of (*a*) the minute hand, (*b*) the hour hand of a clock?

7. A man walks one and a half miles, then turns through an angle of 45°, walks half a mile, turns through an angle of 60°, and walks two miles. How far is he from where he started?

8. Three men start from the same point, and walk NE., N., and W. at 3½, 4, and 4½ miles an hour respectively. How far will they have gone and how far will they be apart in twenty minutes?

9. Draw the following triangles—sides 1½, 2, 2½ inches; sides 7, 9, 12 cms.; sides 6, 6, 6 cms.

10. Describe a circle, and draw a number of lines across it, terminated in each case by the circumference. What are these lines called? Bisect these lines by others at right angles. What do you notice about the new lines? You are given three points: A is 7 cms. from B and 12 cms. from C; B and C are 10 cms. apart. Draw a circle to pass through A, B, and C. Find, by measuring, the radius of the circle.

11. You are given a curve which may be a portion of the circumference of a circle. Find out whether this is so, and find the radius.

12. Draw to scale two wheels 1′ and 6″ diameter, touching one another. Suppose these are toothed, so that when one turns the other turns. Then if the larger one turns through 300° per second in the direction of the hands of a watch, find (*a*) the direction and number of revolutions per minute of the smaller wheel, and (*b*) the angular velocity in degrees per second.

13. Three wheels, A, B, and C, in contact are 9″, 6″, and 4½″ diameter, and their centres lie on a straight line. Suppose them to be toothed, find the direction and velocity of C when A makes 75 revolutions per minute in the opposite direction to the hands of a watch. Make a drawing first.

14. From a point outside a circle draw a line to *touch* the circumference. At the latter point draw the radius, and measure the angle between the radius and the first line. What is the first line called, and how many such lines can be drawn from the same point? Find by altering the position of the point and varying the size of the circle whether the angle between the tangent and the radius is always the same.

15. Draw to scale two pulleys, 3′ and 4′ diameter, and 12′ apart. Find by measuring and calculation the length of straight and crossed belts passing over the two pulleys. If the large pulley makes 160 revolutions per minute, what is the velocity of the small pulley? Does the crossed belt make any difference in (*a*) the velocity, (*b*) the direction of rotation of the second pulley?

16. Compare the angles at the centre and circumference of a circle by means of tracing-paper. Repeat the drawing with different sizes of circle and arc, and state your conclusions. (This is best treated as a class exercise in which all the students draw different sized circles, and measure the angles on arcs of varying magnitude. The results should then be tabulated on the blackboard.)

17. What is the largest angle you can draw in a semicircle? Does the size of the semicircle make any difference? Is your result true for any segment of a circle? What is the bearing of your inquiry in answer to Question 16 on this point?

18. From what you have learnt in seeking an answer to Question 17 can you devise a method for drawing a tangent to a circle from a given point? For example, a point is situated 6 cms. from the centre of a circle 3 cms. diameter. Find without drawing the tangent the point on the circumference which the tangent would pass through if it were drawn.

Section VI.

The next stage is to arrive at rules or formulæ for the measurement of area.

Explain first that a rectangle is a figure all the angles of which are right angles. Let the class draw rectangles on squared paper, and infer the rule for area by counting the unit squares in a row and the number of rows. The rule may be stated in the now familiar shorthand, $A = L \times B$, and a few practical examples worked on area, cost of materials, and labour.

Consider next the case of a square, in which the length and breadth are equal. The rule now becomes $A = L \times L$, or $A = B \times B$—that is, $A = L^2$ or B^2. Explain that owing to this fact a number multiplied by itself is said to be "squared," and each of the numbers is said to be the "square root" of the product. Show how to obtain square root (*a*) by inspection, (*b*) by factors, (*c*) by the ordinary arithmetical process. Use the symbol $\surd$ freely.

Draw diagonal of rectangles. Trace and superpose. Hence express rule for area of a right-angled triangle as $\frac{B \times H}{2}$.

Explain parallel lines as being an equal perpendicular distance apart. There is no need at this stage nor with this type of student to flounder in the subtleties of Euclidian abstractions, even as modified by Playfair. Lines which are out of sight of one another, or which melt away at either end into the shadowy depths of infinity, have no interest for us. But the student may draw parallel lines and then another line across them, and by tracing the angles on tracing-paper find out those angles which are equal to one another.

It ought to be apparent to the class now that rectangles on equal bases and between the same parallels are equal in area. If it is not, let them draw the rectangles, and by means of tracing-paper apply one to the other. Since the right-angled triangle is equal in area to half the rectangle on the same base, it is an easy deduction that right-angled triangles on equal bases and between the same parallels are equal in area.

Consider next parallelograms. Show that the rectangle is a special case of a parallelogram. Show how to construct the equivalent rectangle. Demonstrate by drawing, cutting out, and superposing, or by the use of tracing-paper. Hence deduce rule for area as $A = L \times H$. Divide parallelograms by diagonals, and demonstrate the equality of the triangles thus formed by the method of superposition.

Extend the rule for the area of a right-angled triangle to that for any triangle, and express as $A = \frac{B \times H}{2}$.

Show how polygons may be divided into triangles and their area measured in this way, and apply it to determine the area of a field of which the sides are given.

Deduce the relation between parallelograms and parallelograms, triangles and parallelograms, and triangles and triangles, on the same or equal bases and between the same parallels. Inquire how the area of a triangle varies with the altitude. Convert parallelograms into triangles of equal area, and *vice versa*.

Ask for definitions of rectangle, square, parallelogram, rhombus, triangle, etc. In this connection reference may be made to the remarks on definition in Section IV. The students must be led to see that their definition should include neither too much nor too little, and that what it does include should be exact. Thus if a student says that a triangle is a figure bounded by three sides, a figure with three curved sides should be drawn on the board, when the following colloquy might conceivably take place :—

Q. Is that what you mean?
A. No, sir.
Q. Why not?
A. The sides are not straight.
Q. Oh, then, the sides must be straight?
A. Yes, sir.
Q. Now define a triangle.

Some students may refer to the three angles as well as the three sides, in which case they may be asked if a three-sided figure containing more or less than three angles can be constructed. Similarly, alternative definitions may be discussed.

Some exercises may be set on the determination of the area of irregular figures by means of squared paper, but they need not be numerous. The method is not of very great value, and inasmuch as it involves no new principle, may easily descend to mere mechanical drudgery. Its application to regular figures beyond the stage necessary to establish the formulæ is wholly unjustifiable. The function of experiment was marked out clearly in the second article; it is to give that nucleus of experience which enables the mind to grasp the wider presentation on authority, and permits an inference of some stability to be drawn.

Again the writer would offer an uncompromising opposition to the method of comparing areas by weighing. This is of little or no practical importance, and it is logically out of place here, for it involves the assumption that the thickness and density are both constant, or that one varies inversely as the other.

When experimental methods were first introduced into schools, there was extraordinary activity in devising all kinds of experimental tricks. These are about as useless as were the disquisitions of the mediæval schoolmen. They provide a certain amount of manipulative exercise, but lead nowhere. One of the most

insidious dangers to be avoided in dealing with students over twelve years of age is to let the teaching begin and *end* with measurement. The evening school teacher in particular cannot afford to make pointless excursions off the main track, for with the time at his disposal he must, to paraphrase a sentence by a well-known writer, concentrate even though his coat-tails be on fire! Let us leave these play methods to those who have the inclination and leisure for them, and comfort ourselves by the reflection that most of the foolish things a man does belong to his hours of ease.

EXERCISES—DRAWING AND NUMERICAL.

1. Draw a square about 2″ side, a rectangle about 3″ × 2″, and a parallelogram about the same size, and containing any angle you like. Then draw the diagonals in each case. Are the diagonals equal in any of the figures, and if so, in which? Do they bisect one another? What are the angles between the diagonals in each figure? In the case of the parallelogram how do the angles vary with the extent to which the parallelogram differs from a rectangle?

2. A five-barred gate has to be constructed for an opening 10 feet wide. It is to be about 4′ 6″ high, and to have two vertical bars in addition to the ends, five horizontal bars, and one diagonal strut. The ends are to be made of 4″ × 3″ stuff, and the rest of the gate of 3″ × 1″. Sketch the gate, and find how much timber will be required, allowing for clearance at the bottom, and for the end pieces to rise above the top bar.

3. Construct a triangle equal in area to a rectangle 2½″ × 1½″. Repeat this, having given that the triangle must have an altitude of 2″.

4. You are given a triangle with sides—9 cms. × 6 cms. × 5 cms. Construct a rectangle equal in area.

5. Draw a circle about an equilateral triangle whose sides are 3″. Join the centre of the circle to the corners of the triangle, and measure the angles between the radii thus formed. What do you notice about them?

6. From what you learned about the diagonals of a square in answer to Question 1 and your answer to Question 5, devise a method of drawing an equilateral triangle, a square, a pentagon, a hexagon, and any other regular polygon, in a circle.

7. Find the area of an equilateral triangle, square, pentagon, and hexagon inscribed in a circle 3″ diameter.

Note.—If Questions 6 and 7 are set for homework before Section VIII., they will form an effective preparation for the work of that section.

8. A rectangular room 28′ × 24′ (or the room you measured) is to be refloored with boards 6″ wide. How many feet would be required, and what would be the cost of the material at 10s. per square, allowing 10 per cent. for waste? Is this allowance for waste excessive?

Note.—A "square" is 100 square feet.

9. Find the area (*a*) in square feet, (*b*) in square metres, of the room you measured at the beginning of the session.

10. A painter receives 6d. per hour, and can do 4 square yards an hour. Find the cost of painting a piece of wood fencing 60′ long and 5′ high with three coats. Paint 3d. per lb.; 1 lb. covers 6 square yards one coat.

11. How many tiles 6″ square will be required to tile the lower part of the walls of a bathroom 12′ × 9′ with a dado 4′ high?

12. How many tiles 6″ square will be required for the floor of a kitchen 16′ × 17′ 6″? There is a stone slab in front of the range 4′ 6″ × 1′ 6″.

13. How many pieces of paper 21″ wide and 12 yards long will be required for a room 18′ × 16′? The paper is not required to extend above the picture rail, which is 8′ 6″ from the floor. The door-frame is 7′ 4″ × 3′ 8″, the window is 9′ × 5′, and the fireplace with overmantel is 7′ 6″ × 5′. What will be the cost if the paper is 1s. 6d. a roll and the contract price for hanging 7d. a roll? Do you think from the contract price for hanging that the paper is plain or figured? How would this affect the estimate in another way?

14. Find the number of square feet of lead required to line a sink 3′ × 2′ × 6″, allowing 1″ to turn over the top edge. What would be the weight if 6-lb. lead were used?

15. Find the amount of tin plate that will be required to make a rectangular box without lid 40 cms. × 25 cms. × 6 cms., allowing 1 cm. for the overlap at each of the four vertical edges.

Note.—Questions 14 and 15 should be solved by "development" and measurement of the drawing.

16. Find the sectional area of a railway cutting 30′ deep, 25′ wide at the bottom, and 50′ wide at the top.

17. How much paint would be required for the whole of the outer walls of a square house 30′ high, and standing on 1,000 square yards of land, and whose window surface is in proportion to the total wall surface as 1 : 8? One pound of paint will cover 6 square yards, one coat.

18. It takes 7 lbs. of whiting to make 6 pints of distemper, and 2 pints of distemper will cover a ceiling 9′ × 7′. How much whiting will be required for the following ceilings, and what quantity of distemper must be made for them?—Two attic ceilings, each 14′ × 10′; 7 bedroom ceilings, each 12′ × 14′; 3 entertaining-room ceilings, each 18′ × 15′; 1 kitchen 16′ × 15′; 1 scullery 13′ × 13′; passages and stairs 82′ × 4′ 6″; hall 18′ × 13′.

19. Square up the following dimensions of sheet lead by means of duodecimals and find the total weight of lead: one piece of 7-lb., 3′ 8″ × 2′ 7″; 1 piece of 6-lb., 2′ 9″ × 1′ 6″; 1 piece of 5-lb., 4′ 6″ × 8′ 4″.

20. Find how many superficial yards of lath plastering there would be in a room 28′ × 18′ × 14′ high. The cornice extends 18″ on the ceiling and 12″ on the walls. Deduct: 1 doorway 7′ × 4′ 6″; 2 windows, each 8′ × 6′; 1 fireplace 5′ × 4′; and a skirting 12″ high.

(*To be continued.*)

THE NEW "SCHOOLMASTER."

AS all our readers know, the *Schoolmaster* has become the property of the National Union of Teachers, and is now under the editorship of Mr. Yoxall. The first number of the new series is before us as we write, and without invidious comparisons we think we can say that it takes, as teachers are now taking, a wider view of the world in which we live.

The leader is as brief as it is modest, graceful, and effective, and its concluding words show the influence of the new pilot:—

"The *Schoolmaster* sets sail anew, but under the old flag and towards the old desired horizons; yonder the guiding stars still shine, and yonder waits the port. And this is the glad yet solemn 'first day out,' as Thackeray called it, when he thought there was no passenger aboard but asked a blessing as he sat down to table, while the good ship dipped over the bar and bounded away into the blue."

Much of the new matter of the paper is of the kind which ought to appeal to the varied, extraneous interests of its readers—articles on literature, art, and science, and even sport. The article on books and pictures is significantly signed "Y." One hopes that it is a standing feature. Here you are:—

"Books and pictures! and music. Perhaps in these lies the better part of life. At Westminster Abbey the other day I heard the strains of Chopin's *Marche Funèbre* go rolling and rallying along transept, choir, and nave as we mourned the loss of a maker of noble books. In the great rose-window of Poets' Corner hung a picture, of a myriad lights and tints—figures of saints and sages, teachers and singers; the lamp and the lute, the pen, the paint-brush, and the pointer were there displayed; all arts, all forms of intellectual appeal are portrayed in that vast circle of glass. 'All go to one place, all are of the dust, and all turn to dust again,' groaned the basso voices of the choir; but I thought of what books and pictures and music can do for the mind and spirit as the boys' voices clarioned, 'He shall feed me in a green pasture, and lead me forth beside the waters of comfort; He shall convert my soul.'"

All the old features are here, and among the strictly professional matter is a column of notes for teachers in secondary schools, well written and really interesting. The new series begins well. From the above it will be gathered that "the Union's own organ" will no more play one tune than does its accomplished Editor, to whom, as one of our own valued contributors, we offer the heartiest wishes for a good and prosperous voyage.

GIRLS FROM THE LAND OF PRINCESS JULIANA.
(By permission of Messrs. T. Cook and Sons.)

AN INTERESTING SCHOOL JOURNEY.

BY GEORGE W. ROOME, B.SC.

ON one of the writer's Rhine trips he had the good luck to be practically introduced to a form of school journey which is unfortunately difficult to carry out in this country, but offers several interesting and suggestive features.

A party of sixteen Dutch lads accompanied us on the voyage by river steamboat from Rotterdam to Mannheim (for Heidelberg) and back.

Led, fed, encouraged, and occasionally controlled by two men teachers, with two ladies to assist in the management of the commissariat, the whole trip was a valuable piece of experience alike for those concerned and for those of us who had the privilege of looking on.

The boys' parents belonged apparently to the commercial or shopkeeping class. Presumably the expenses would be beyond the means of artisan parents, in spite of their being kept down by an enormous amount of careful planning, agreements with the steamboat company for inclusive terms, and the like. Compared with what an ordinary traveller would have spent on the same journey, the total cost must have been very low. It was both amazing and amusing to see packet after packet of provisions appear from the cabins of those in charge as each meal-time came round.

We were made aware of the youngsters' arrival on board in the early morning in the fashion natural to boys, and not limited to any nationality; and there was no more sleep. The time of departure was marked by farewells to parents and stay-at-home comrades, cheers for most things in turn, followed by eager excitement at novelties, and some lively guessing and disputing over the probable contents of closed barges passing up and down the river, all aided and abetted by the teachers in the background for the very obvious reason of recalling names of much-studied imports and exports.

Once out of sight of Rotterdam, we were treated to the first of many "topical" and local songs. "Leaving Home" and "To the Rhine" were subjects affording fair play to forebodings of both kinds.

A noisy, hearty breakfast passed the time until Dordrecht came in sight, when the keen discussions over new discoveries broke out anew. Loading and unloading barges at the quays were sharply scanned, criticised, and the contents noted. The remnants of a Rhine raft in a backwater served as a useful text for remarks on the source, course, and destination of its materials.

Farther on, historical buildings and places had their stories retold as we passed them, with much use of well-learned quotations; and the time never dragged throughout the day.

After leaving Nymegen, the last large Dutch riverside town, the point where the so-called Rhine diverges towards Arnhem and the "old Rhine" was duly noted and its geography revised; and then a sharp lookout was instituted to discover the frontier. "How was it to be recognised? What would tell them when they were in Germany?" with the why and wherefore of it all. Much argument ensued upon the discovery that for some three miles the south bank was Germany and the other Holland. Which country did the river belong to? The settling of this question led up to, and impressed, a knowledge of the position and work of customs-houses that is bound to be useful in after life to many of these future Rotterdam business men who will be engaged in the immense transport trade between Germany and the North Sea by way of the Rhine and Maas.

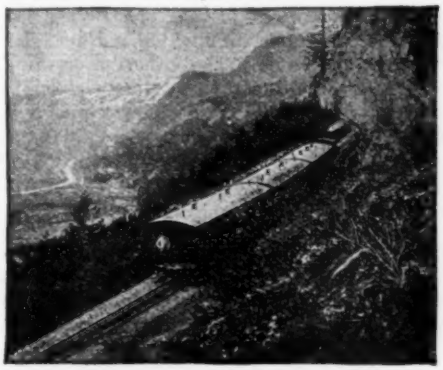
An unexpected treat was the appearance—at the extreme point where a Dutch war-vessel might be—of an almost microscopic gunboat, engaged in the protection of the revenue in some inexplicable fashion. To the joyful astonishment of the crew of that "man-of-war" the Dutch national anthem greeted them as we passed, and a ceremonious acknowledgment of the flag and of our young patriots' courtesy took place. We had not exhausted our good luck, for shortly afterwards, on the other side of the frontier, an equally diminutive though smarter-looking German gunboat was passed, and in order to emphasise the fact, the "Watch on the Rhine"—in German—was duly given.

A whole shopful of flags were promptly hung out to dry by the delighted German "white-jackets," presumably as a thank-offering for something that relieved their monotonous existence.

Evening was now drawing on, and lots were drawn as to parties for a two hours' run round the quiet Dutch-looking streets of Emmerich, the first town in Germany at which the steamer stops for a few hours. The customs examination of luggage, with replies to the officer's questions in his own tongue, was seriously gone through, amid a running comment on its commercial and other aspects; and the rival parties set out to study the town. Late as it was when they returned, the process of packing away for the night was much hindered and enlivened by boasts of what each party had seen more than the other, and of their success in finding the way by asking for directions in German. For a few hours quietness reigned, but at an unconscionably early time next morning there were sounds of life which made it hard to believe that the young travellers were not healthy British boys.

The furnaces of Ruhrort, the fragments of historical Kaiserswerth, and other objects on banks and river combined with breakfast to keep the party fully occupied until Dusseldorf was reached. By great—sus-

piciously great—good fortune, the gruff-speaking old captain was able to intimate that there would be a clear forty-five minutes' wait at this point. Immediately a plan of invasion was drawn out, and we separated on the landing-stage from two noisy but keenly-observant bands, determined to learn as much as could be learnt of a strange city in forty minutes. We came upon them



THE BRUNIG RAILWAY, CHAMOUNIX.
(From Messrs. Thomas Cook and Sons' New Programme.)

again suddenly in one of the squares of Cologne. They were as busy as ever reading and commenting on signs and notices, asking questions of market-women, policemen, or any one who looked useful, and rarely meeting with impatience or a rebuff. When questioned, they were able to give a boyish but fairly clear account of the outstanding features of both cities without any confusion between them.

One wondered, even with the improved "newer methods" of language teaching now coming into vogue, how many British lads from a secondary school could have made themselves understood and collected information at the rate these Dutch youngsters were doing. There seemed to be no hesitation, and we found there was no fear of getting lost. Each knew if he missed his party where to make his way. But there was no straying, for fear of missing something the others saw. Every minute of the stay at each point had something planned for it; and their knowledge of the places, especially of anything of the remotest possible use commercially, was simply wonderful.

As any one who has made the trip is aware, the scenic interest of the Rhine begins above Bonn and extends to Bingen. When travelling by the Netherlands Rhine steamboats, the first part of this is lost because one is holidaying, and will not leave the bunk at unearthly hours merely for a bit of scenery. Our youthful friends, however, were on the alert before the boat had reached Andernach, and most of the other passengers found it easier to rise than to sleep. The constant passing of boats up and down, usually parallel-sided, blunt-ended barges eighty or more feet in length, of which anything up to half a dozen were in tow of one powerful tug-boat, provided an equally constant theme for conversation, and the towns and villages on the banks served to fill in the gaps. To boys the scenery was naturally of comparatively little interest; castles obtained passing attention, particularly when some story of fighting or the name of a Rhineland hero could be connected with them. The Lorelei Rock provided excuse for the singing of Heine's verses, and an occasional centre of trade furnished more prosaic items. Bingen, for example, presented its usual animated river-front and crowd of boats in the river awaiting dispatch or the transfer of their cargoes.

The national monument on the hill opposite was one of the few objects of interest to which they did not pay a visit, owing probably to cost and lack of time; but a description and a few national airs taught its lesson.

Mayence received the same treatment as Cologne in two instalments; what had to be omitted the first evening was taken on the return journey.

On the morning of the fourth day after leaving Rotterdam, amidst wild excitement, the end of the boat journey was reached; and as the boat was to leave Mannheim on its return barely seven hours later, no time was lost in landing, marching to the railway station, and taking train for Heidelberg.

The main facts in the history of the picturesque old ruined castle had evidently been assimilated beforehand, and views of the castle shown. So much was clear from the remarks made as various parts came into view, and the special events with which each was associated were recalled to mind. A brisk walk around the town and dinner were followed by the return to Mannheim and the boat, not forgetting a run along the quays to look for goods likely to be sent by boat to Rotterdam; and considerable eloquent supervision was exercised over the goods being stowed away in the hold of our own boat for that same destination.

The return journey afforded numerous chances to rub in or recall to mind details learned during the upstream voyage, and also to visit certain places passed in the night on the first occasion. Thus a good half hour proved ample for the practical study of the geography of Coblentz, of interest alike historically, architecturally, and as a meeting-point for trade routes in all four directions. As a fitting close to the study of the scenery of the river itself and the Seven Mountains, the party left the boat in the early afternoon to walk to the top of the Drachenfels for a last look over the beautiful hilly district through which the Rhine forces its way, and which we were now leaving for the flat plain of North Germany and Holland.

SCHYNIGE PLATTE.
(From Messrs. Thomas Cook and Sons' New Programme.)

The party descended in time for the later boat, and overtook us in Cologne that evening. Immediately their meal was over, preparations were commenced for the celebration of the last evening of the trip. Chinese lanterns and an odd lamp or two transformed the after-end of the boat; and a concert, to which the other passengers were welcomed, was soon in full

swing. So long as the items were limited to Dutch, German, and French we were interested, but had ceased to be surprised or impressed by the knowledge these lads of twelve to fifteen had of two languages besides their own. The special treat, however, rehearsed somehow on the quiet, for the benefit of the British teachers who had taken such an interest in them, was the singing of three English songs by the whole party. It was a mixed selection, consisting of the National Anthem, "Home, Sweet Home," and a nigger melody; but criticism was scarcely courteous under the circumstances, and we were able truthfully to congratulate the vocalists on the success with which the pieces were rendered. At the request of the senior teacher in charge, our thanks were conveyed in English; and though the most applauded sentences were naturally the—very halting—attempt at praise and thanks in Dutch, several of the boys showed a determination to master English, in order to be able to tackle the next Englishman whom they met. By this time, doubtless, they will be quite competent to ask their way about, ask and answer the most useful travelling questions, and probably write a number of simple business letters in our language.

Pleasant as the journey had been, the last day was naturally spent in anticipating the arrival at home, and very few minutes after reaching Rotterdam sufficed to scatter the happy, excited crowd of boys, parents, and friends, to finish those wonderful accounts of the journey of which we heard several beginnings before the landing-stage was crossed.

One delightful feature of the whole trip had been the habit of self-control shown by these pupils. Lads they were, of course, with the love of life and mischief every true boy is endowed with. But when conditions called for it they were able to show a good fellowship which all English youths have not at command, and a tactful courtesy which some older British travellers ought to envy and copy, but unfortunately seem to forget, especially when they become foreigners amongst "foreigners."

THE TURN OF THE TIDE.

GEOMETRY AND GRAPHIC ALGEBRA: AN ENCYCLICAL.*

BY A MATHEMATICAL MASTER.

EUCLID, the master logician for all time, from his seat on Olympus † might have noted the rapid and successful advance of German trade. Could he, we wonder, have deduced the consequent sudden removal of his works from British schools, and added Q.E.D. to his argument?

The story of secondary education during the past decade is full of interest, and not the least interesting is the part which belongs to mathematical teaching and culminates with the pamphlet under review. It originated from a panic made in Germany. Some one suggested that the root cause of Germany's successful commercial life was her superior educational organisation. Commerce is the first word in the English language. This linking of education and commerce at once brought the former into the front rank of political battle. Educational experts hurried to the Fatherland. They were conducted by officials over the best of the German schools. The schools were ready in their Sunday best. The experts reported. The British public revels in panic; the German schools were good enough for the revel. Something must be done. England must wake up.

Never was a panic started with less cause. The individuality of the English school is worth more to the nation than all the machine-made education over yonder. But something had to be *done*. The British Government awoke to its responsibility, but a Royal Commission was not appointed. The other alternative was adopted—a batch of inspectors were elected to put all these matters right. This course serves a double purpose, and is the usual one; something is done, and at the same time many well-paid pensioned posts are created, for which the recommendations of political supporters can be accepted.

The new secondary school inspectors began work; their duties were indefinite, their position at times none too pleasant. One met such extreme cases as a chemist with no teaching experience advising a highly-qualified mathematical master with years of experience how to do his work. However, the inspectors were there, and they had to find a *raison d'être*. In the mathematical classroom they struck oil with graphs and practical geometry. Here was something tangible, something they could ask for and inspect. The gospel of graphs was preached assiduously the country through. Mathematical teaching was to find salvation in a hard pencil sharpened chisel shape, or turned on a bit of emery paper, according to the taste of the inspector. Masters, against their better judgment, and often under protest, turned their pupils on to more and more drawing to satisfy inspectoral demand. Graphical work was at full tide.

It was generally allowed that results were far from satisfactory. The Board of Education applied the same remedy again—they appointed a new and better qualified body of chief inspectors. Let us at once gladly admit that the result on the whole was good. A more rational view of inspection was an immediate consequence. The tide of graphical work was stayed.

But the experiment was highly dangerous, for it created in each branch of secondary work an autocrat. Now, an autocracy is dangerous unless the autocrat is divine. A man may be highly qualified and of large experience, yet fall short of divinity. In such a case private views or personal fads enunciated by the autocrat are apt to be accepted as important principles. It is a one man show. A large variety of methods in our schools differing fundamentally may indeed be bad; a uniform method stereotyped in paltry details is worse.

Euclid, the bed-rock of geometry for two thousand years, has gone. In his place we are offered Circular 711. However, let us be thankful so far, for the Circular states plainly and concisely that "practical geometry is never to be an end in itself;" "graphic work should not be treated as an end in itself." This is indeed the turn of the tide.

The pamphlet outlines a course of geometry in three stages. The whole paper is a collection of assertions. With much of it we are in hearty agreement. For the rest, let us state clearly that argument is impossible. To criticise is to enter on a battle of assertion, "experience *versus* experience." Like a story told by an explorer, we are expected to accept it in detail, not because we are offered any direct proofs of its truth, but for the negative reason that we have not been there. The

* Board of Education, Circular 711, March 1909.
† This is our contributor's own mythology.—Ed.

writer of the Circular, to back his views, brings forward the experience of a general inspection of schools. There is a danger of giving too much weight to such evidence. Men have a habit of defining the situation in their own terms and from their own point of view, and then pointing out how exactly the situation corresponds with their prophetic foresight. So inspectors, when they find their pet ideas being carried out in any school, feel that the work in that school is indeed a "success;" the success of this school is then attributed to the use of the methods which the inspector favours—a vicious circle.

Success is a premature word: the success or failure of present-day teaching can be better gauged fifty years hence, when it will be known whether geometry as a subject still exists. Further, we doubt whether the effects of systems of teaching can be tested by a series of inspections. The results depend so much on the character of the boys taught.

Most schoolmasters will have observed in their own schools the extraordinary variations in sets of boys. The writer has noted a case. One year the top set of boys in their "third year" were almost without exception mathematically sound. In geometry the whole class galloped through the syllabus and progressed far beyond; all did riders with apparent ease. The very next year this same set contained no really capable boy. It was a tax on the writer's powers of invention to find a rider easy enough for any one of them to do. To cover the usual syllabus was impossible. And note the point: both these sets of boys had the same previous history; they had been under the same masters, and followed the same syllabus. How different would have been the results of inspection in these two successive years!

The main ideas in the course suggested are that in the *first stage* boys should be made familiar with concepts such as solid, surface, line, point, volume, area, length, direction, angle, and parallelism. Definitions are to be avoided and axioms omitted. In the *second stage*, Euclid I. 14, 15, 27, 28, 29, 32, 4, 8, 26 are to be taught as a "broader basis of axiom and postulate." They are to be based on *intuition*, and reinforced by practical work, in which neatness and accuracy are to be regarded. The *third stage*, based on this, is a course of rigid deductive proof (not described), propositions being given in the first instance as riders, and practical work kept in advance of theoretical knowledge.

Three criticisms of this Circular suggest themselves:—

(1.) *The language is extravagant, which lessens its effect.* Thus we are told that Euclid I. 4, 8, 26 "dealt with in this way may be mastered by the class in a *few minutes*, and attention may at once be turned to their use. The enunciations must, of course, be learnt." The propositions on parallels and I. 32 are dismissed by letting a boy think of a man walking along a broken line. "It is found as a matter of experience that the propositions so presented appear to the pupils as *luminously self-evident, and the whole can be done very quickly and very effectively.*" We do not object to the proof by rotation implied, but to the hyper-optimistic expectations. Again, "The student *must* be capable of doing riders."

(2.) *The inclusion of paltry details, which detracts from its dignity.* "In revising the work, it is good to ask what proposition do you use in proving such and such a proposition?" Consider such obvious advice occurring in a six-page treatment of the whole of geometry.

(3.) *A general indefiniteness, which deducts from its practical value.* The impression the whole paper conveys is that boys are expected to proceed to the definite *vid* the indefinite, to the rigid *vid* the loose. After considerable drawing, after accepting many things as "self-evident," they are suddenly to emerge at a stage where the rigid proof is expected. Those who actually teach large numbers of boys will agree that nothing is more easily acquired than slackness of proofs, nothing is harder to eradicate. The result of drawing is that quite good boys will fall back on useless drawing when it is less trouble, and will waste time with a ruler and pencil when asked to do an obviously theoretical rider. Nothing can be more dangerous than this doctrine of the self-evident. Every day one meets the boy who regards a result as self-evident, but examination speedily discloses that his premises are false. The final object of the course suggested is "rider solving;" a less likely result we cannot imagine.

What we feel about the whole matter is that, having been robbed of Euclid, we want something in its place. If from some authoritative source we could get a definite statement of the irreducible minimum of propositions which could be regarded as a foundation, and, further, a definite order in which they should be proved, then indeed geometry would right itself. The general effect of the last few years would be good. The undoubtedly dull form of the accepted translation of Euclid is gone; no one desires to include those propositions which were due to Euclid's necessarily narrower view of the subject. Such are I. 2, and those needed because two right angles did not make "an angle." But let us have a common basis, so that boys can pass from school to school without being completely out of it geometrically. It is the fundamental principles we need in common, and not fads.

The suggestions given in this direction so far as they go are excellent: group propositions of like character; base the work on congruent triangles and parallels. A continuation of these suggestions would have been of more value than all the generalisations and details considered worthy of inclusion.

The part of the Circular which deals with graphs can as a whole be readily agreed to. Thus, speaking of text-books, "the whole subject, in fact, is looked at not from the point of view of elementary algebra, but from that of analytical geometry, of which, indeed, as presented in most text-books, it forms *a premature and attenuated version.*" This is thoroughly sound.

We doubt whether plotting statistics or "London to Bristol" curves is of much value, and experience tells us that boys take a long time over such work. No doubt this kind of work can replace some evaluation; but if drawing elucidates geometry, arithmetical substitution equally makes clear the meaning of algebra.

One case is detailed on page 11 at length. To introduce indices and logarithms the plotting of $2x$ and $10x$ is suggested. We have been doing this as a first lesson as long as we can remember, but we cannot say that "the process will be found to give boys a firm and vivid conviction of the reasonableness of the extended definition." There is something inherently objectionable to boys in logarithms; boys will get correct answers, but few can write out the working in a presentable form. Any examiner will bear out this statement.

Finally, the pamphlet may be described as suggestive and useful. Its real indication—namely, the turning off the graphical tap—is thoroughly acceptable. Its optimistic conclusions, however, betray the arm-chair theorist as opposed to the practical teacher.

Papers for Teachers of Infants.

THE EARLY EDUCATION OF CHILDREN.*

BY CLARA E. GRANT, DEVONS ROAD INFANTS' SCHOOL, BOW, E.

(*Continued from page 654.*)

Writing.

WE are glad to see that Miss Plaisted pleads that all early writing should be large—"a variety of free-arm drawing"—and that writing on ruled paper should not be begun much before the age of six. Dr. James Kerr, the enlightened medical officer to the L.C.C. Education Committee, once pleaded that no paper work should be done at all below Standard I., and we feel ourselves that the plan would mean equal progress in the long run, and would, moreover, banish the difficulty of the "style" of writing, especially in cases where the two senior departments follow different styles, as sometimes happens. In any case, none of the modern styles really lend themselves to "large" writing nearly so well as the old round hand, with its graceful curves and its good foundation for future individuality of style. We notice that Miss Plaisted makes no plea for correlation of style with that of the senior departments—probably this matter is amicably arranged in her own case—but it is obvious that where writing is done by infants at all, it should prepare for the upper school. The form of writing is not in itself of sufficient importance to count as a principle which must not be violated, and it is certainly wasteful to teach infants a style which must be undone in the senior departments. In such minor matters as these the infants' teacher will be wise to co-ordinate her methods, and so perhaps secure freedom for herself in matters of larger importance.

Number Teaching.

Upon the teaching of number Miss Plaisted has some wise things to say, though we are a little surprised to see that she recommends number work as far as 20-24 for children under Standard I. Of course we did once, in our folly and blindness, go far beyond this, giving young children a power of paper manipulation of high numbers which certainly did not mean a concrete grasp of the actual numbers involved, and it is true that in most infants' schools the number work is still carried as far as 20-24. Miss Plaisted wisely pleads that number work confined to very low numbers may become monotonous and uninteresting, and she also upholds the view taken by the "Committee of Fifteen," that it is a mistake to insist on too great thoroughness, which may produce "arrested development in the mechanical and formal stages of growth. The mind in that case loses its appetite for higher methods and wider generalities." A plea is also made that children should follow their own method and not always work from the "10," as some authorities insist. For example, with 9 + 8 it may obviously be easier to work it 8 + 8 + 1, or 10 + 8 − 1, than to say, "Take 1 from the 8, and put it with the 9 to make 9 into 10; 7 and 10 are 17, so 9 and 8 are 17"—a decidedly long and logical and involved piece of mental work for young children. Whilst agreeing equally with both these points of view, we still feel that in ordinary infants' schools (and it is these which should fix the general standard) it would be better to secure a thorough working knowledge of numbers 1–10, developing power and grasp of every side and every possible application of those numbers, as the best foundation for future number work; and many educationists are coming round to this view. The knowledge of numbers 1–10, or perhaps 1–12, is based on what can be easily manipulated and visualised; that of numbers beyond 10 or 12 involves abstract reasoning and memorising of processes as well as of visualised work, and the effort is great for young children. There is, after all, no more time in the infants' school day than there was of yore, yet how much more in the way of physical exercises and rest, language, manual work, variety of occupations, we attempt, and it is really these which are fitting the child for ready grasp and adaptability, for strength of mind and of body. We think it would be best not to attempt number work formally at all in the "Fives" classes, and to limit the "Sixes" to numbers 1–10 or 1–12 (12 has many interesting and practical applications), together with easy money problems within the children's experience, measurement of all kinds, and all varieties of easy number applications of numbers to the objects around.

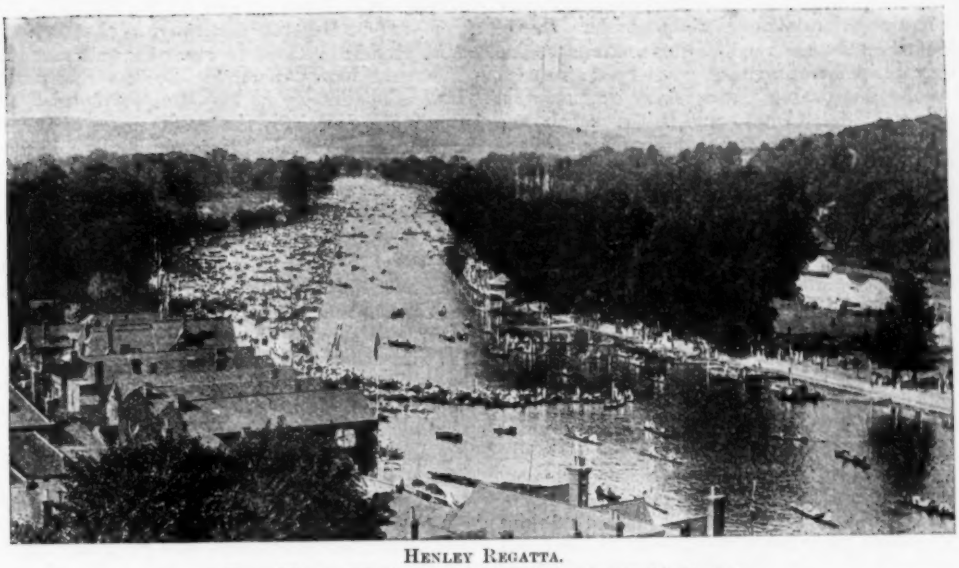
In all these matters it is important to remember that it is comparatively easy to cater for the child who fulfils the three conditions absolutely essential to normal progress—namely, normal age, normal attendance, and normal capacity. Were infants' schools entirely composed of such children, life would be for them and for their teachers—oh, so easy! But, unfortunately, probably not a half of our children, in poor neighbourhoods scarcely a third, would fulfil these three conditions, and it is in the truest interests of these tender children that we must arrive at some wise compromise; whilst as for the well-favoured child in all three essentials, and the child whose mental precocity helps him to overcome other difficulties, it is just these who need careful watching if they are not to be overpressed. Let us remember the dictum of the physician of a leading lunatic asylum for children, that many patients are there because of the mental pressure they suffered during their infant years.

In any case, Miss Plaisted gives us many valuable suggestions for number teaching, not forgetting the wise detail that, whilst for young children dealing with small numbers a variety of material is necessary to prevent monotony, for older ones dealing with larger numbers it is probably best to keep to one material—for example, counters, with perhaps the addition of the ball frame. Miss Plaisted pertinently calls attention to the fear we have of allowing children to use their fingers whilst giving them other objects as aids. Is not the point of danger rather not that fingers are less suitable and useful, but that they cannot be taken away from the child when the moment for genuine unaided memory work arrives?

Handwork.

Miss Plaisted strongly supports the modern plea for motor training as an aid to brain development, and

* A review of Miss Plaisted's book bearing this title, recently published by the Clarendon Press.



HENLEY REGATTA.
(From Messrs. Ward, Lock, and Co.'s London Guide Books.)

advocates it in every lesson. She quotes Dr. G. Stanley Hall's important dictum, "From the ages of four to eight there is great danger that over-emphasis of the accessory (or smaller) muscles will sow the seeds of chorea or aggravate predispositions to it," and she rightly pleads that fine and accurate work must not be expected.

With regard to the vexed question now gathering round the teaching of drawing to infants—namely, whether the child shall be left absolutely alone or be helped by the teacher—Miss Plaisted takes the position that "the children must try for themselves, and, after they have made their attempts, the teacher may demonstrate methods of dealing with certain special points;" and she has observed, as most of us have, that even with the object in front of them, the children are apt to draw "from images already in their mind." A wise conclusion seems to be reached in the dictum that whilst "in these days no good teacher of infants wittingly encourages drawing from the flat, we are apt to forget that the provision of objects for drawing by individual children, or of large objects for class drawing, is not enough, unless constant vigilance is exercised to encourage careful observation of the object." And it is not merely in the effort of correct observation that the child needs help, but also in the effort to express that correct observation in his drawing, and this is just where the modern theorists differ. There seems to us no reason why children should not have the benefit of trained guidance both in "seeing" and in reproducing, otherwise much time must be wasted before they can make a drawing satisfactory to themselves or to others. It is obvious that certain laws of perspective, of adjustment of solid surfaces to a plane, and so on, must be to some extent taught, nor can we altogether keep pictorial flat representations of objects from the child who has constantly before him pictures, books, blackboard drawings, and his comrades' efforts.

We think Miss Plaisted here makes a wise compromise, though, like many of us, she runs counter to the extremists. We are not sure, however, that the "outline" of an object is "an abstraction, and hence a later development than the more natural and complete representation of the whole in mass." Our experience of many thousands of free pictorial drawings (absolutely "free") has taught us that it is only here and there that a child draws an object in the mass when left to himself. The obviously wise plan is to use either outline or mass according as seems most suited to the object concerned, and not strain ourselves to evolve "massed" teapots out of "massed" oranges. There has been far too much emphasis laid (not in the book before us) on certain of these minor matters, until we are seriously in danger of losing our sense of proportion.

A TALE FOR THE STORY HOUR.

"BAA, BAA, BLACK SHEEP."

BY LILY FRITH.

THE biggest boy in the Baa family was lost. He had wandered away from his mother and brothers and sisters in the early morning, when the milkmaid came through the meadow and left the gate open. His mother had been very sorrowful all day; she had gone from field to field calling him, but could not hear or see anything of him. Now it was getting late; there was that pretty light called twilight over everything, which light, though very pretty, helps to *keep* you miserable if you *are* feeling rather so. She thought he must have wandered up the far-off hill and got quite lost. By-and-by, as she lay sadly thinking of her son, she heard his call at the gate of the meadow. Mother Baa went in big jumps to that gate. She licked his nose joyfully through the bars, but told him he would have to go to sleep in the field he was in, as the gate was very securely fastened. Then they both lay down to sleep, in different fields it is true, but very close together for all that. The sun was up early next morning and shining on the meadow with all his might; also on Mother Baa, whom he soon made open her eyes. The sun had made her *open* them, but when they *were* open

they saw something that made them open wider. On the other side of the gate was the straying son, and behind him a funny black creature that caused the surprise. Such a lot of "baa-baaing" was heard by the other sheep that they wondered what could be the matter, and promptly ran to see. It seemed that Boy Baa said the black thing was a friend of his, whom he had met in his travels, and asked, "Could he bring him into the field?" Mother Baa said, "No, she could not think of such a thing; she didn't believe the black thing was a sheep at all, though he said he was." Just as they were disputing, the milkmaid came along and opened the gate. Mrs. Baa, who really was so glad to see her boy that she couldn't be cross long, said reluctantly that "the black sheep," if it *were* a sheep, might come in too. The "black thing" accordingly came in, and having come in felt very uncomfortable — everybody stared so inquisitively, as though they wanted to know everything about him; which really was what they did want, and being sheep they had no notion of being polite and pretending they didn't. After much shaking of heads and many "baa, baas," it was decided to ask him if he had any wool, that being considered the best test of his claim to be a sheep, for nobody with *any* claim to "sheepiness" would be without wool. Father Baa was sent up to the black thing, it not being considered proper for Mother Baa to speak first to the stranger, and greeted him most politely with, "Baa, baa, black sheep." The visitor quickly understood, and answered with "Baa, baa" just as politely. Then the old sheep put the question, "Have you any wool?" Without stopping one single minute to think, the "black thing" answered eagerly—he knew they would let the lambs play with him after this—that he had. Earlier in the summer, he told him, he had been covered with lovely soft thick wool, and this had been cut off and had filled three bags. One had been for his master, the second for his dame, and the other had been given away to a little boy, who lived and laughed and cried, and did everything else in the lane at the bottom of the hill. "Who were his dame and his master?" and "Had his tail been cut off at the same time as the wool?" were the next questions asked.

The black sheep said, "That is a long tale." "A long tail!" said Father Baa. "Whoever heard of a sheep with a long tail in our country?" The strange sheep was just beginning to explain what he meant when Mother Baa came up, wanted to know what they were talking about, and said he had better tell his story to all of them. The sheep fixed themselves in the shape of "half a ring," and the black sheep sat down between the two old ones in front of them, and began to tell his story. He told them that at one time his family used to live in a meadow just as they did, but that one day, good grass being very scarce, their mistress, Bo-peep, suggested taking them up the side of the hill in search of some, and that they agreed. She dressed herself in her best silk dress, which was a pretty pale blue with flowers all over it, her big straw hat with ribbons flying behind, and carried her long crook-ended stick, and led the way to the hill. "We climbed and climbed," added the sheep, "until poor Bo-peep seemed to be tired. You see," he remarked, "she wore boots, which are very stupid things to climb in." Just as she was sitting down to rest they all heard a long, loud blast from a horn, and Boy Blue appeared on a side path. He was delighted to see his little friend in such an unusual place, and at once sat down beside her—not to frighten her away, as that ugly spider did Miss Muffet, but just to cheer her and make her laugh. That was easily done, for Bo had always liked Boy Blue, and this day he looked especially nice, for he was wearing a new suit, the exact shade of the sky, with a collar that looked as if it were really and truly a tiny cloudlet that had fallen on him in the right place to make a collar. He believed that everybody enjoyed themselves that day; he *knew* that he and the rest of his friends did, and certainly the two "people" looked as though they were doing so. These two had never once looked at a sheep, or anything else for that matter, for the whole day, they had been so busy looking at each other, and had never discovered until nearly nightfall that the sheep had wandered farther up the hill. "All at once," he continued, "we heard a horn blown very loudly time after time, and much calling and even *shouting*." Some sheep hurried down the hill, whereat Bo and Boy were very joyful; but others — himself among them—had found the mountain grass so delicious, and besides that had somehow got so touzled and black and untidy-looking, and also by some mysterious means had lost their tails, that they were ashamed for their mistress to see them, and so stayed where they were. He said: "We felt rather lonely at first, but in a few days Tom the Piper's Son, who had stolen a pig and had had to run away, came up the hill. He was fond of hills," went on the black sheep, "and played a tune about them to us, and we all lived with him after that. He is a very good master so long as we give him the three bags of wool; one for himself, one to send home to the dame his mother, and the other, as I said before, for the little boy in the lane." Thus with a loud "Baa, baa," he finished his tale.

The sheep were all very charmed with the story, and all wanted to rub his nose to show their friendship; but as this became rather trying, the black sheep baa-ed "Good-morning," and gave them all an invitation to come and see him on his mountain to taste his delicious grass. All but the very timid ones promised to do so—even they, I expect, would follow when the others went; and he in return promised to visit them again very shortly to have a real jolly frolic.

MORAL TEACHING FOR INFANTS AND JUNIORS.

BY MABEL A. BROWN.

Scheme for July.

Central idea—Humility and contentedness.

Divisions of Subject.

1. Not to think more highly of ourselves than we ought to think. Talents, home circumstances, physical gifts are not of our own creating, but are sent to us by God to make use of for Him and His service. Give instances of sudden changes from prosperity to poverty through no fault of the persons concerned—for example, failure of business or of a bank, etc. Disfigurement from accident or illness—a very frequent occurrence. None of these things can alter the *character*, which is the great thing. They are exterior to the man, while his character is a part of himself. Great men are

never vain of their achievements. They acknowledge their indebtedness to God, who gave them the talents and genius by means of which they have gained renown. Give examples from the great men of history—Peter the Great working in a dockyard, etc.

2. Respect the advice of older and wiser people, and the opinions of every one. Point out the rudeness and bad breeding of putting forward one's own opinions too prominently to the exclusion of other people's point of view. Always listen patiently and consider the opinions of others, and endeavour to take the advice of older people. Pride and self-will usually go together. It is not well to be too independent, especially when we are too young to know very much about the world. Boys and girls should listen carefully and respectfully to the advice of their parents, the teaching of their Church, their teachers in school. Older people often say how many mistakes they would have been saved had they listened to the good advice of their parents. (Tell Bible story of Rehoboam, who listened to the advice of the young men who had grown up with him rather than the counsel of the old men, with such disastrous result, 1 Kings xii.)

Bible Stories.

Story of Nebuchadnezzar (Dan. ii.). Pride goeth before a fall. Story of Pharaoh (Exod. v. to xiii.). Pride hardened his heart so that he would not let the Israelites go. Story of Solomon (1 and 2 Chron.), who, after the promise of his youth, fell away from God in his old age through pride in his state and his possessions. Story of Job and his great humility (Job). None of the great calamities that happened to Job could make him rebel or lift up himself against God. The humility of Christ—shown in His lowly birth and humble circumstances, His baptism in Jordan, His silence before Pilate and His accusers.

Other Stories.

"Meek and lowly," "Is it mine own?" "Voices at the gate" (*Earth's Many Voices*); "Climbing alone" (*Earth's Many Voices*); "Training and restraining," "The law of the wood" (*Parables from Nature*); "Arachne" (*Nature Myths and Stories*); "The walnut tree that wanted to grow tulips" (*Kindergarten Stories and Morning Talks*); "The Goose Girl" (*Grimm's Fairy Tales*); "Cinderella;" "The boy and the angel" (Browning).

Recitations.

"The mountain and the squirrel," "The modest violet" (*Books for Bairns*, No. 84); "John Grumlie" (*Books for Bairns*, No. 104); "The ant and the caterpillar" (*Model Poetry Books, Junior Division*—Blackie); "The queen of the buttercups" (Miss Warmington's *Recitations, Rhymes, and Dialogues*).

Nature Study.

Fruit and seed.—What fruit is, and how it is formed by the most inconspicuous parts of the flower.
Summer fruits—strawberries, cherries, currants, etc.
Kinds of fruit—drupes, berries, nuts, etc.

Kindergarten Occupations.

Brushwork.—Clay modelling, drawing, paper-cutting, colouring, all connect themselves naturally with the study of fruit. It is unnecessary to give suggestions for such obvious connections, especially as space is curtailed this month in order to give a list of books mentioned in this scheme during the past year.

USEFUL BOOKS FOR TEACHERS WORKING OUT THIS SCHEME.

Story Books.

Nature Myths and Stories, by Flora J. Cooke (Curwen, 2s. 6d.); *The Story Hour*, by K. Wiggin and N. Smith (Gay and Bird, 2s. 6d.); *Parables from Nature*, by Margaret Gatty (George Bell, 3s.); *Earth's Many Voices* (compiled) (Society for the Promotion of Christian Knowledge, 2s.); *The Animal's Friend* (annual) (George Bell, 1s. 6d.); *The Jungle Book*, by Rudyard Kipling (Macmillan, 6s.); *Just So Stories*, by Rudyard Kipling (Macmillan, 6s.); *Tanglewood Tales*, by Nathaniel Hawthorne; *Grimm's Fairy Tales* (F. Warne, 2s. 6d. each); *Andersen's Fairy Tales* (F. Warne, 2s. 6d.); *Legends of Greece and Rome*, by Grace Kupfer (George Harrap, 1s. 6d.); *In Nature's Storyland*, by H. E. Hirons (George Philip, 2s. 6d.); *Tales and Poems for the Kindergarten*, by Gladys Davidson (O. Newmann, 2s. 6d.); *Books for the Bairns* (Stead, 1d. each.)

General Reference.

Longfellow's poems, Tennyson's poems, Keats's poems, Browning's poems, Wordsworth's poems, Lowell's poems, Shelley's poems, Coleridge's poems, Gray's poems, M. Arnold's poems, C. Rossetti's poems. *The Brook and its Banks*, by T. Wood (Religious Tract Society, 3s. 6d.); *The Boyhood of a Naturalist*, by Fred Smith (Blackie, 3s. 6d.); *Country Walks of a Naturalist with his Children* (Newmann, 3s. 6d.); *Eyes and No Eyes*, by Arabella Buckley (Cassell, 6d. each, or 3s. 6d. the six books). Emerson's essays, Thoreau's essays, Lubbock's essays, Kearton's books on bird life (Cassell).

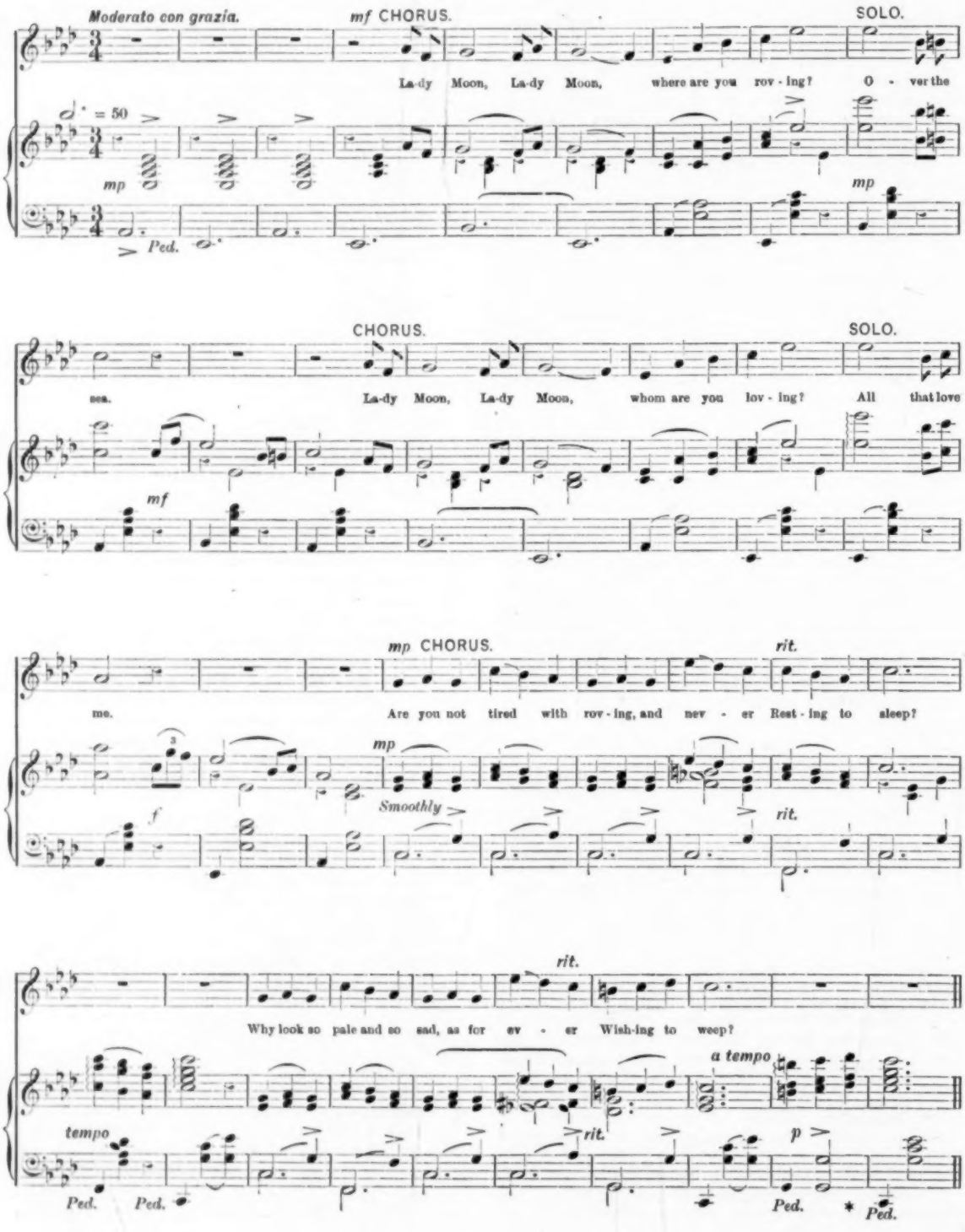
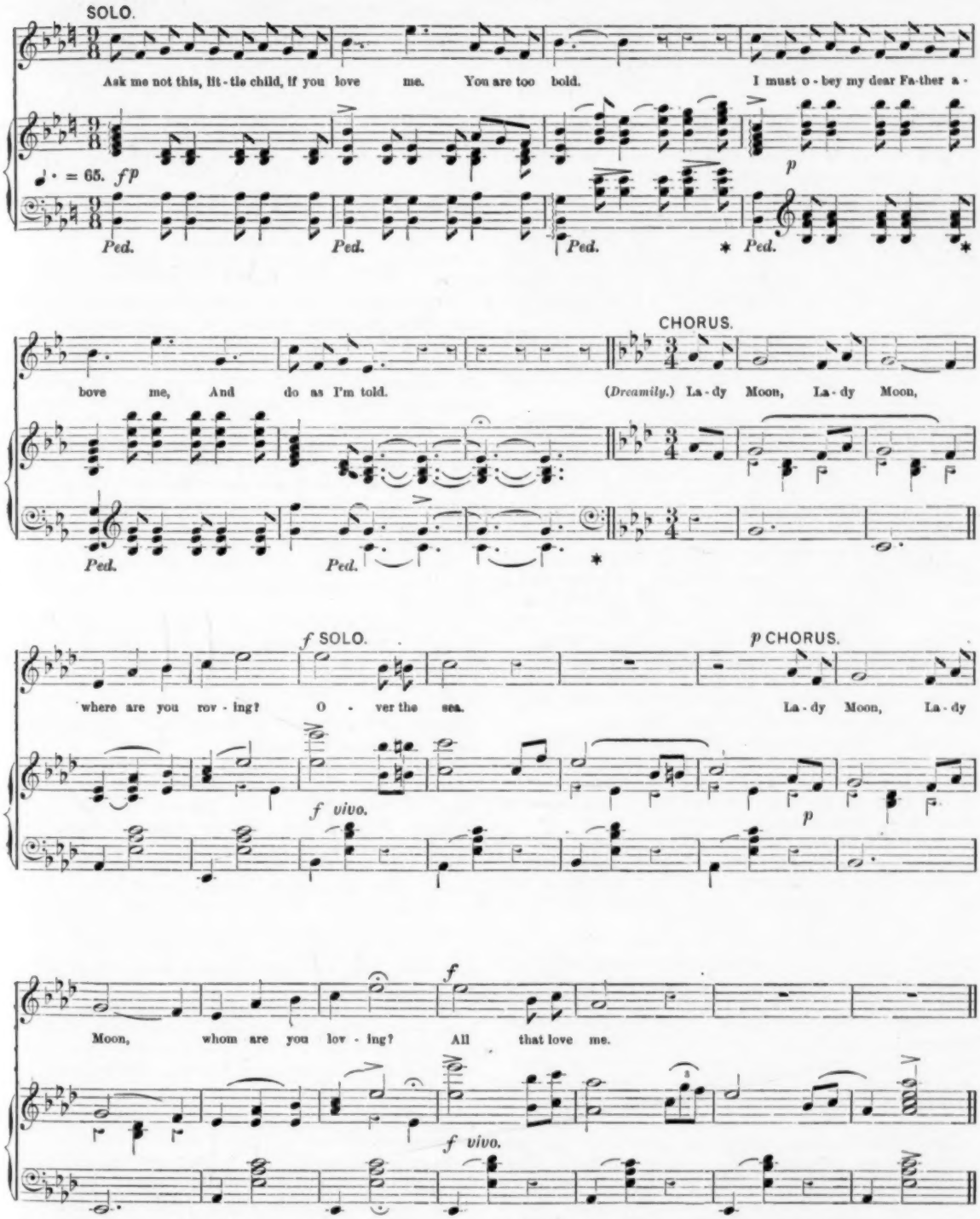
Song Books.

Songs for Little Children, by Eleanor Smith (Curwen, 4s. 6d.); *Finger Plays*, by Emilie Poulsson (Curwen, 2s.); *Child's Song and Game Book*, by Keatley Moore (Sonnenschein, 4s.); *Kindergarten Songs and Games*, by Madame Michaelis (Sonnenschein, 4s.); *Child's Garden of Verse*, by R. L. Stevenson (Enoch, 1s.); *Hymns and Choral Songs* (Sunday School Union, 1s. 3d.)

Recitation Books.

English Poetry for the Young (Blackie, 1s.); *Poems of English History* (A. and C. Black, 1s. 6d.); *Poems for Junior Schools*—1. Spring, 2. Summer, 3. Autumn and Winter—(Horace Marshall, 3d. each); *Recitations for Infant Schools* (Blackie, 6d.); *A Cycle of Song*, 24 Books (Nelson, 2d. each); *Model Poetry Books* (Blackie, 2d. each); *Recitations, Rhymes, and Dialogues* (George Philip, 1s. 6d.); *Little English Poems* (Horace Marshall, 1s. 6d.).

Words by LORD HOUGHTON. **"LADY MOON."** *Music by* F. H. SQUIRES, F.R.C.O.

(Unison Song for Solo and Chorus.)

SOLO.
Ask me not this, lit-tle child, if you love me. You are too bold. I must o-bey my dear Fa-ther a-
♩. = 65. fp
p
Ped. Ped. Ped. * Ped. *
CHORUS.
bove me, And do as I'm told. (Dreamily.) La-dy Moon, La-dy Moon,
Ped. Ped. *
f SOLO.
p CHORUS.
where are you rov-ing? O-ver the sea. La-dy Moon, La-dy
f vivo.
p
f
Moon, whom are you lov-ing? All that love me.
f vivo.

EDITORIAL NOTES.

FRENCH PRIZE COMPETITION.

THE Award in this Competition will be announced next month, when the work will be resumed as usual.

ESSAY COMPETITION.

THE date for the reception of pupils' essays (see last month's issue) has been extended, by request, to July 1.

OUR COOKERY COLUMN.

BY ROSAMOND CANDY, FIRST-CLASS DIPLOMÉE, NORTHERN COUNTIES SCHOOL OF COOKERY.

THE FEEDING OF INVALIDS.—(*Continued.*)

Milk, which is indispensable in invalid cookery, is often refused by the patient. It should be sipped in small quantities in order to prevent curdling, or diluted with soda-water, lime-water, or barley-water.

Bread and Milk. Scald a basin with boiling water, and place in it some cubes of stale bread. Boil a little milk, and pour over the bread; cover over with a plate for five minutes, and then serve with a little sugar or salt added.

Eggs. These may be taken raw or beaten up with milk, or added to the broths already referred to. The best way of cooking eggs for an invalid, when he is able to take them, is in the form of an omelette.

Egg and Port Wine is often given as a restorative. *Method.*—Beat up the egg, and add one half-gill hot water, a little sugar, and one half-glass port wine.

An egg swallowed whole, *without beating*, is considered the very best tonic one can take.

Cooling drinks form an important item in invalid dietary.

Lemon Water. Place the juice of three lemons and the thinly-pared rind of one into a jug; add one and a half pounds loaf sugar, and pour over the whole one quart of boiling water. After standing about one hour, strain it, and allow to cool thoroughly before using.

Lemonade. Take one lemon and pare the rind thinly; place this in a jug with the juice and one and a half ounces sugar; pour over one half-pint *cold* water; cover, and allow to stand for two hours. Then use.

Barley Water. Take one ounce pearl barley, wash it, then pour over it one and a half pints water. Add the rind of a lemon thinly pared and a little sugar. Simmer gently over the fire until reduced to one pint, stirring frequently. Strain, and allow to cool.

Toast and Water. Toast a slice of bread until well browned, without being burnt. Pour over it a quart of boiling water, and allow to cool. The flavour of this may be greatly improved by the addition of a roast apple and a little lemon rind and sugar.

The above recipes are all for invalids who are extremely ill, and who are not allowed anything solid.

The following are a week's menus for the convalescent:—

MONDAY: *Breakfast.* (8 a.m.)—Poached egg on toast, tea. *Light luncheon* (11 a.m.).—Cup of chicken broth. *Dinner* (1.30 p.m.).—Steamed fish and sauce, arrowroot pudding. *Afternoon tea* (4 p.m.).—Tea and bread and butter. *Supper* (7 p.m.).—Bread and milk.

TUESDAY: *Breakfast.*—Oatmeal porridge made with milk. *Light luncheon.*—Egg and port wine and biscuits. *Dinner.*—Braised chop, custard pudding. *Afternoon tea.*—Tea and toast. *Supper.*—Cup arrowroot.

WEDNESDAY: *Breakfast.*—Bread and milk, boiled egg, and tea. *Luncheon.*—Beef-tea. *Dinner.*—Chicken panade, omelette. *Afternoon tea.*—Sponge-cake and tea. *Supper.*—Glass hot milk and bread and butter.

THURSDAY: *Breakfast.*—Buttered egg on toast and cocoa. *Luncheon.*—Mutton broth. *Dinner.*—Minced beef and lemon sponge. *Afternoon Tea.*—Tea, bread and butter. *Supper.*—Steamed whiting, glass of milk.

FRIDAY: *Breakfast.*—Grilled cutlet, tea and toast. *Luncheon.*—Calf's foot jelly. *Dinner.*—Stewed tripe and white sauce, light bread pudding. *Tea.*—Tea and buttered toast and biscuits. *Supper.*—Cup of gruel.

SATURDAY: *Breakfast.*—Grilled sole and cup of tea. *Luncheon.*—Sago soup and toast. *Dinner.*—Beef quenelles and mashed potato, roast apple and cream. *Afternoon Tea.*—Piece plain cake and tea. *Supper.*—Lemon jelly.

SUNDAY: *Breakfast.*—Boiled egg and toast, cocoa. *Luncheon.*—Jellied beef-tea. *Dinner.*—Sweetbread (in white sauce), velvet cream. *Tea.*—Bread and butter and tea. *Supper.*—Irish moss jelly.

ICES AND SUMMER DRINKS.

July, being sometimes a month of hot, dry days, makes one think longingly of ices and cooling drinks. Ices are so easily and inexpensively made that they ought to figure more prominently in the ordinary catering of the general household. An ice-machine is quite a reasonable utensil to purchase, and can be obtained for a few shillings.

There are various kinds of machines on the market, but the ordinary freezing-pails are always satisfactory. These consist of an inner vessel, in which the mixture to be frozen is placed, and an outer pail. The freezing mixture—ice and salt—is placed in this outer pail and surrounding the inner or freezing vessel.

The most satisfactory freezing mixture is obtained by mixing two parts of well-pounded ice to one part rough salt.

The two chief varieties of ices are water ices and ice-creams. The foundation of all ice-creams is a *good custard*, the varieties being obtained by the addition of various flavourings.

Water ices can be varied in the same manner by the addition of fruit juices or flavourings. Lemon-water ices are the most common.

Vanilla Ice-cream (No. 1, rich). *Ingredients.*—Custard. One pint milk, two teaspoonfuls sugar, three eggs, half-teaspoonful vanilla essence, half-pint cream. *Method.*—Beat the eggs, add the sugar and milk, place all ingredients into a jug. Place this in a pan of boiling water, and *stir until the custard coats the back of the spoon;* add the essence. Allow this *to cool*, and add the cream; place this rich custard into the freezing vessel, and pack the outer vessel with ice. Stir until the mixture begins to set. Allow this to remain for a time until firm, and serve daintily in ice-cream glasses with wafer biscuits.

Strawberry and Raspberry Ices are made in the same way, adding the strained juices of the fruits or jam instead of the vanilla; or add a teaspoonful maraschino if wine flavouring is desired. Coffee essence is added to make coffee ices.

NOTE.—The use of too much sugar will often account for the mixture *not* freezing. The proportion should never exceed one quarter-pound sugar to one pint custard.

Vanilla Ice-cream (No. 2, plainer). *Ingredients.*—One pint milk, one egg, one ounce cornflour, two ounces sugar, essence, a little cream (optional). *Method.*—Smooth the cornflour with a little cold milk, bring the rest of milk to boiling-point, pour over the cornflour, return to pan, and add the egg and sugar and flavouring, and stir until thick. The mixture must not be allowed to boil. Allow this to cool and place in freezer, and proceed as in recipe No. 1.

NOTE.—A very good and cheap custard is made by using Birds' Custard Powder instead of cornflour and eggs.

Lemon Water Ices. *Ingredients.*—Six lemons, twelve lumps sugar, half-pint water, one pint syrup. *Method.*—Rub the knots of sugar on the rinds of the lemons; squeeze and strain the juice of the lemons; add half-pint water and one pint syrup, which is obtained by boiling three-quarter pound of sugar in three-quarter pint water until the sugar is thoroughly dissolved. Add all these together, and leave until cool; then place in the freezer, and proceed in the usual way.

NOTE.—These water ices are improved by the addition of the whites of two eggs beaten to a firm, stiff froth and sweetened with one and a half ounces sugar, and added to the lemon water just as it is beginning to set in the freezer. The preparation should be frozen solid and left in the ice until wanted.

Iced Pudding (high-class cookery). *Ingredients.*—Half-pint rich custard, quarter-pound sugar, quarter-pound mixed fruits (candied), one ounce almonds and pistachio nuts, half-pint cream, flavouring essence, or one tablespoonful liqueur. *Method.*—Prepare custard, and allow to cool; add the cream and flavouring; place the basin into freezer, and half freeze this mixture. Next add the fruit and almonds and pistachios; finish freezing; place the whole of this lightly into mould, which has previously been standing in ice; cover with a close-fitting lid and seal well the edges with butter or lard, bury the mould in the ice, and allow it to stay for several hours. When required, remove the lid, turn out, and serve immediately.

NOTE.—If any difficulty is experienced in removing the lid, apply a warm, wet towel, dip the mould in tepid water, and the pudding will turn out satisfactorily.

COOLING BEVERAGES.

Lemonade (1).—Boil a quart of water with three-quarter pound loaf sugar, and pour this syrup over the rinds of six lemons; allow these to soak for two hours; add the strained juice of the lemons and two quarts of water. Pass the whole through a jelly-bag (to clear), and serve in glass jugs. This will make about seven pints of lemonade, and cost tenpence.

NOTE.—A great improvement to the above lemonade is the addition of a small piece of ice in each glass.

Lemonade (2)—**Boston Cream.**—Dissolve three pounds sugar in three pints of boiling water; allow it to cool. Then add three ounces tartaric acid, three pennyworth essence of lemon, and the whites of two eggs beaten to a stiff froth; place in bottles, and use. To drink the above, put a little in a tumbler and fill up with soda-water.

Lemonade (3) (extra good).—Dissolve three pounds sugar in three pints boiling water; add four ounces citric acid and one ounce soluble essence of lemon; bottle, and use as desired. To use, place one tablespoonful of the syrup in a tumbler of cold water.

Claret Cup.—Pour a bottle of claret into a large jug, and add a glass of sherry or brandy, or any liqueur preferred; add the thin rind of lemon and two ounces castor sugar. Allow it to stand for one hour until the sugar is thoroughly dissolved. Just before using add two bottles of soda-water and two bottles lemonade, and a large piece of ice.

NOTE.—Sliced peaches, or raspberries, or nectarines may be added in place of the lemon rind. Sliced cucumber too is sometimes used.

THE NEW GEOMETRY.—Our mathematical readers interested in the somewhat confusing changes in the teaching of geometry are recommended to examine a new volume just issued by Messrs. Ralph, Holland, and Co. It is entitled *Concurrent Practical and Theoretical Geometry*, and it contains the substance of Euclid, Books I. to XI., treated both practically and theoretically. The author claims that his method is that of the Board of Education, and as the Board's inspectors will doubtless insist upon this method, a word to the wise is sufficient.

N.U.T. NOTES.

BY ALLEN CROFT.

Mr. Runciman's Bombshell.

UP to the time these "Notes" are penned, the President of the Board of Education is sticking manfully to his guns, and sending back the numberless questioners and deputations which beset his path with very little in the way of practical consolation. The strongest argument in favour of his famous Circular is that the reforms therein adumbrated are already in operation in many parts of the country; and it is certainly time that the pace of the slowest of our local Education Authorities was accelerated a little. The opponents of the Circular seem to have played into his hands somewhat by the extravagance of their denunciation, and the wild estimate of additional expenditure demanded as a result of its introduction. He has displayed intimate knowledge of various localities' requirements, which will be eminently useful should there be a struggle on the floor of the House of Commons; and naturally enough, the National Union of Teachers is exerting its utmost energy and influence in bringing a knowledge of the contents of the Circular before the notice of all whom it may concern, and particularly the parents of our school children, the members of trades, labour, and co-operative societies, and, above all, members of the House of Commons. If Circular 709 does not eventually materialise in the shape of vital modifications of the Code of 1909, one will cease to think that this (or any other) Government cares one jot for the fundamentals of education.

* * *

Should Head Teachers teach?

IN his reply to the deputation which waited on him from the Municipal Corporations' Association, Mr. Runciman made a number of practical suggestions with the object of making the path of reform easy and light, and he used the expression "*by requiring head teachers to teach*," a *sestetto* of words which has fluttered the educational dovecotes from Berwick-on-Tweed to the Land's End. Probably the members of the deputation came away feeling that they had been indulged with a sort of Barmecide feast; but their feelings were mildness itself compared with those of many teachers in the country who read into the President's words a suggestion that head teachers should be required *to take charge of a class*. What he really meant to convey only himself can attest; but surely he is not so ignorant of the demands on a head teacher's time—I am discussing the position from the standpoint of the fairly large school—as to think it *possible* even for such a teacher to assume nominal charge of a class, and at the same time perform the various and multitudinous duties which fall to his lot.

Of course the head teacher should teach, and, in my humble judgment, teach a good deal. His teaching and influence, however, should be exerted throughout the whole school, and every child ought to have the benefit of some portion of his skill and experience. Personally, I always devote as much time as possible to the work of my first class; and for the rest, I teach where my services seem to be most needed. To attempt to tie a head teacher down to a single class is to perpetuate weak spots and bad methods, whilst every practical teacher knows how grievously the education of the children in his self-allotted class would be interfered with by those interruptions from parents, managers, officials, etc, which seem to be inevitable.

Our Readers' Column.

STUDIES OF BOOKS THAT ARE WORTH WHILE.

BY SUSAN CUNNINGTON.

IV.—Sir Walter Scott (1771-1832).

1. "The Heart of Midlothian." 2. "The Bride of Lammermoor." 3. "The Fair Maid of Perth."

IN the early years of the nineteenth century, Scott was already famous for his long story-poems—*The Lay of the Last Minstrel*, *Marmion*, and *The Lady of the Lake*. Byron had offered him respectful homage, and Wordsworth had listened with delight to Scott's recitation of his *Lay* when he visited him with his sister Dorothy during their tour in the Highlands. The stirring music and glowing romance had caught the popular fancy, and awakened new interest in the great events of English and Scottish history. Then their author, full of enthusiastic energy, vivid imagination, and with the most complete command of moving language, sought to exercise his great gifts in a rather different way. Writing to a friend, he observed: "The force in the *Lay* is thrown on style; in *Marmion* on description; and in *The Lady of the Lake* on incident. Here I am throwing the interest more on character." This new departure was *Rokeby*, the scenes of the story being near Greta Bridge, in Yorkshire, and at Barnard Castle.

Writing in hot fervour, Scott had completed the poem in three months; but popular taste was changing, and there was less admiration and interest aroused than by the earlier ones. Meanwhile the possibility of failure in any future verse compositions had led him to attempt story-telling in prose, and one or two romances had been begun and left. When, in 1814, his *Lord of the Isles*, centred round the Scottish hero Bruce, was finished, he by chance came across the manuscript of a novel which he had begun ten years before. This was the first of the long series of twenty-nine with which, during the next eighteen years, he delighted the readers of his day, and enriched for all time the literature of Britain.

The title "Waverley" was, in years to come, to name the whole collection; but for a long time the growing series appeared under different descriptions, as "Novels and Tales," "Historical Romances," "Novels and Romances," and "Tales and Romances," by "the Author of *Waverley*," the authorship being at first a close and then an open secret, which Scott himself loved to keep concealed.

Scott's boyish love for ballad poetry had led to the composition of his metrical romances, and in discarding verse for prose he kept to the same kind of subject. It should be remembered that the terrible excesses of the French Revolution took place when Scott was a young man, and that by inheritance, tradition, and, circumstances his whole feeling was against the principles of which the Revolution seemed to be the outcome. Instead of desiring or welcoming change, a great body of British feeling dreaded and avoided change. Whether in things religious or social or political, Scott, by instinct and upbringing, shared strongly in this sentiment.

Hence, in seeking materials for his novels, Scott went to the historical records with which his early reading had made him familiar; and his stories fall into three main groups—those taken from Scottish history, those from English history, and those which mingle both. The three which we are about to consider belong to the first group.

Although there had been plenty of romances of history before the Waverley novels appeared, yet to Scott belongs the proud distinction of originating the true historical novel. At first, and indeed most often, he chose a period not very remote from his own time; far enough removed, as has been pointed out, to have become interesting and unfamiliar, and yet not so distant as to seem obscure. Thus in his first novel he indicates the point of view in the title, *Waverley; or, 'Tis Sixty Years Since.*

Usually the period of time would be one in which took place some notable event or sequence of events, in which the issues, whilst exciting and dramatic, were neither irredeemably painful nor overwhelmingly sad. Around and amongst these central occurrences were grouped the private affairs, the loves and hates, the successes and failures, of individuals; often other than the principal personages of the main circumstances. Through the fabric of the whole ran the enlivening thread of a love story, for Scott so far met the demands of the modern novel reader as to attempt no story without some love interest.

At the same time, his robust intelligence and his eager interest in the many aspects and the immense variety of life prevented his developing solely the sentimental side of his tales. Hence his large and leisurely manner, the many characters and their eccentricities, and the continual introduction of incidents and persons whose connection with the main story is slight, make considerable demands upon the idle and pampered novel reader of to-day, for which sometimes his imagination and sympathy are unprepared.

But to the unspoilt reader they are delightful. So happy and so genial is the author's outlook that, though there are sorrows and crimes and pain and death, these are relieved and lightened by simple human joys and achievements, friendship and faith, loyalty and service. No one rises from one of these novels feeling miserable or less able to cope with worries or trials; there is a high-heartedness about them which communicates its influence to the reader. Endurance is not only possible, it is worth while; persistence is not only admirable, it is interesting.

Another characteristic of Scott is that the minor personages are often the ones, not only with whose delineation he has taken most pains, but also those whom we remember most affectionately. His heroes and heroines seem to have received less loving care in portraiture than many of the characters who play unimportant parts. It is easily seen how much more interesting a book becomes if, besides the principal story, there are side issues and subordinate happenings skilfully appealing to us in a different way.

In *The Heart of Midlothian* there is just this blending of interests. The opening scene of the story is in Edinburgh; the time 1736, that of the Porteous Riots which, in the vigorous telling of the novelist, become real and

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understandable things. The heroine, Jeanie Deans, is acknowledged to be the finest woman character he ever drew. She unites comeliness, though no great beauty, with a high, resolute spirit and a noble and single heart. Nothing will persuade her to tell or even to suggest an untruth in her evidence, even to save her sister from a shameful fate; nor can anything induce her to forego her resolve to undertake a hard and perilous journey and to plead for mercy from the queen herself. This interview, patiently and impressively led up to, is one of the most simply dramatic scenes in the whole range of Scott's novels.

The hero of the book, George Staunton or Robertson, though his daring and audacity are well set off by the quieter personality of Reuben Butler, Jeanie's lover, is less convincing. Effie, the beautiful younger sister, is of the type afterwards to become so familiar in fiction, in which beauty of person and an unhappy fate have to condone unlovely characteristics of mind and much spiritual weakness. The scene in the prison, where Jeanie takes her resolution to save her sister's life, is most moving in its simple appeal, though only some readers may care to follow closely the no less painful description of the trial in the succeeding chapters. Yet the scene lives, and the details, which at first seem long and involved in their presentation, are only those which are necessary to reveal the dread and unknown mysteries of a court of law.

Scott perpetually enriches the narrative of his stories with descriptions of the conditions, appearance, and surroundings of the events which take place. To him everything of custom, of fashion, of behaviour, of manner of life was full of interest. He sees, and desires to make his readers see, the personages of the story in the setting in which they had really lived and moved. And though the actual history is not always presented in the literal manner of a recital of facts, and the connecting motives and links often bear the interpretation of Scott's own sympathies and convictions, yet his sense of proportion and fine grasp of the real bearing of events upon human lives make his presentations harmonise with truth, even when in small details they diverge from fact.

Madge Wildfire is a tragic figure, and she and Meg Murdockson supply an element of mystery and horror which no countryside was without in the England, and still less the Scotland, of the eighteenth and nineteenth centuries. Witchcraft, with its suspicion, its mischief, and its punishment, was a terrifying reality to the untravelled rural population of England and Scotland.

An interesting illustration of the way in which Scott used the materials of history in winning popular attention to the life and the things of the past is shown in his delineation of the great Duke of Argyle. A personality dear to his own age, and whose name and fame had been handed on, is made to stand out clear and true as a benevolent influence amidst its harshness and misery.

In *The Bride of Lammermoor*, which is emphatically a love story, Scott takes his readers back to earlier times—to the years immediately succeeding the "glorious Revolution," and weaves his story around the dispossessed heir of a Jacobite laird. In Edgar Ravenswood is an unmistakable hero, of the Byronic, unfortunate, sensitive type, whose gloomy character and sombre attitudes set the fashion for many a novel in the early nineteenth century. Unlike *The Heart of Midlothian*, the heroine is not a commanding figure; indeed, interest in the fate of Lucy Ashton is maintained only by the sinister forecast of tragedy in which the story presently culminates. In this episode Scott used the tradition attaching to the noble Scottish family of Dalrymple of Stair, whose echoes were still familiar to those who treasured the memories of the past. To modern ideas, both Edgar and Lucy are more fittingly displayed in Donizetti's opera, *Lucia di Lammermoor*, and the real charm of the book lies in the treatment of some of the minor characters.

Of these, Caleb Balderstone, steward at Wolf Crag's Tower, the ancestral home of the Ravenswood family, is the most notable. He is a pleasing embodiment of the virtues and loyalty, the resource and single-hearted devotion, of the feudal retainer. Scott invariably does justice to the humble companions of the great, and reproduces the spirit of the kindly and simple relations which existed between the better representatives of the privileged classes and their dependants. Though times were rough, and might was right, and justice was apt to be one-sided, he shows us that life held much of the satisfaction of which real happiness is composed, even for the least favoured members of society. The solid, sterling worth of the old Scottish yeoman and peasant strain deserved some such commemoration as the large and genial spirit of Sir Walter succeeded in giving.

Many sidelights upon the life of the time are thrown by the introduction of incidents and encounters which have no particular bearing upon the advancement of the main story. Patie Birnie, celebrated fiddler and songster, "with the impertinent freedom of his profession;" the unwilling presence of Lucy at the stag-hunt, "wearing a black silk riding mask," and lamentably wanting in fortitude when invited to accept her Amazonian privilege with the fallen stag; the travellers Bucklaw and Craigenfelt in "Tod's Den," each with his *quaigh* before him; Luckie Lightbody and her thrifty daughter in their humble ménage with the loaded spit; and Mr. Bide-the-Bent, Presbyterian minister, who is seen in gentle caricature—these all serve to make living and real the old times of the late eighteenth century.

It is a happy selection which places together *The Heart of Midlothian* and *The Bride of Lammermoor*. We have thus an opportunity for noting Scott's treatment of the novel with the love element present, and the novel with the love element dominant. The last-named was his only experiment in the narrower field. The great charm of his stories is their wide humanity; their effect that of a sense of largeness and possibility. He shows us life rich and strenuous, and various and entertaining; instead of feeling pent in an airless place after reading one of his books we have an inkling of the wide outlook which invigorates. We understand something of the attitude of his modern disciple and follower, Robert Louis Stevenson, and echo his words—

> "The world is so full of a number of things
> I'm sure we ought all to be happy as kings."

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BOTANICAL STUDY: STEMS.

THE teacher must here briefly recapitulate the lesson on "The Study of Winter Buds" given in the January number, also the lesson on "Bulbs" (February number).

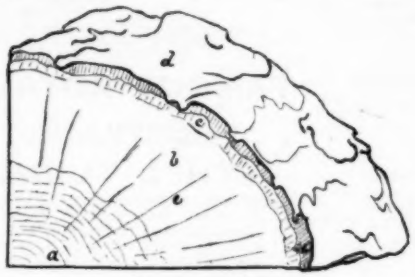
1. *The plumule is a bud;* a bud is a condensed shoot; a shoot is an expanded bud.

A *stem*, which is the axis of the shoot, bears leaves and flowers and fruits. Its chief functions are (*a*) to support the leaves and spread them out to the light; (*b*) to conduct food and water; (*c*) to store food—for example, boles of trees and corms.

2. That stems do conduct water is prettily and easily shown by placing white or pale-coloured flowers in solutions coloured with aniline dyes—for example, red ink, when the petals will gradually become streaked with the colour. Green leaves can be coloured in the same way. The flowers or leaves experimented with must be kept in the sunshine.

3. The special conducting strands can readily be shown by boiling some nettles. Old plantain leaves can be pulled to pieces, and the conducting strands drawn out of them to the length of several inches, if carefully done. A skeleton leaf will show how the strands interlace to produce the network of veins.

4. *The structure of the herbaceous stem.*—Only the most salient points of stem structure can be shown to the children. This is perhaps best done with the aid of diagrammatic sketches on the blackboard, and a few rough sections for the microscope. If the teacher has had any botanical training, he will know how to make rough sections of buttercup or sunflower stems with the aid of a carrot. If he has no experience, one or two large sections can be cheaply purchased. He must not attempt to describe everything in the section, but only the main functions of several well-marked tissues. For example, taking the buttercup section, he must roughly draw it on the blackboard, and then call attention *only* to the following points—(*a*) the skin or epidermis (one cell thick); (*b*) the large circular hole in the centre, usually filled with pith (compare sunflower); (*c*) the general ground tissue; (*d*) the conducting strands (vascular bundles).



SECTION OF OAK.
Showing (*a*) Heart Wood, (*b*) Sap Wood, (*c*) Bast, (*d*) outer layer of Bark, (*e*) Medullary Ray.

Then he must pass on to a brief analysis of the constituent fibres of the vascular bundles, showing that they are made up of—

(i.) *Bast* on the outside.
(ii.) *Cambium* in the middle (a very thin layer).
(iii.) *Wood* on the inside.

Next it must be explained that the *cambium cells* in the living plant are always making *bast cells* on the outside and *wood cells* on the inside, so that the bundles gradually increase in size. But as the buttercup is an annual plant they never become very large, and the stem, containing but little wood, is weak. Such a stem is described as *herbaceous*.

Note.—It is not easy to get children to understand a section as drawn on the blackboard. In order to explain to them what is meant by transverse and longitudinal sections, it is well to make these sections from a carrot before them.

5. *The structure of the woody stem.*—Very nice samples of the woods of various trees can now be purchased, or the village carpenter would make specimens cheaply. They should always have some bark attached, and should be smoothed with a chisel at one end, so as to show the "grain." If possible, some examples should show sections cut along the radius (*radial*), and at right angles to the radius (*tangential*). In this way different features will be brought out. Oak, ash, beech, poplar, and pine (or larch) are the most useful.

Outline of lesson.

(i.) The diagram of the buttercup on the blackboard as before.

(ii.) Then show how the *cambium* layer begins to spread *between* the bundles in the ground tissue, until finally a ring of *cambium* is formed round the section. This ring of *cambium*, by continually forming *bast* on the outside and *wood* on the inside, produces in the end a cylinder

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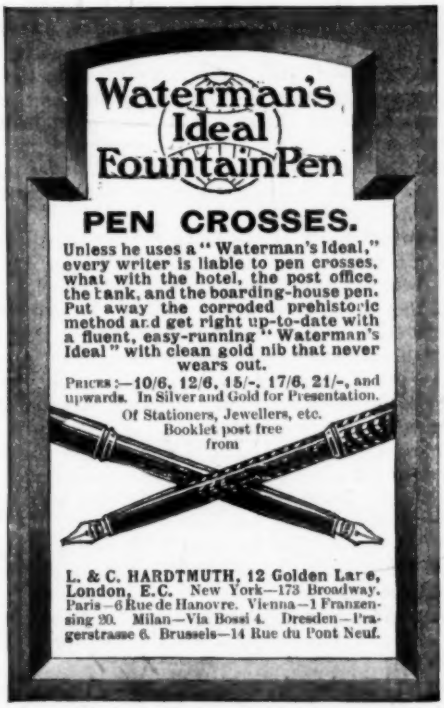
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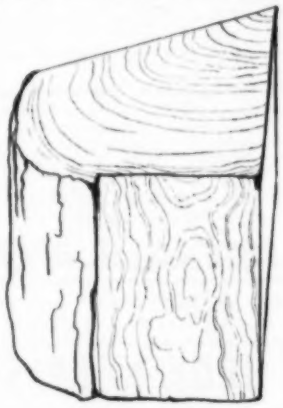
(explain) of *bast* on the outside, and a solid cylinder of *wood* on the inside. This can be illustrated most effectively on the blackboard with coloured chalks. As the hard cylinder of wood increases in diameter, it crushes the pith almost out of existence, and the bast, which is always *very much less* in quantity than the wood, becomes compressed with the remaining ground tissue into a comparatively narrow ring.

All the tissues outside the wood are called *bark*. If in the specimen of poplar wood the very rough bark is loosened so that it can be removed, the *bast* can be beautifully seen as a quantity of long, flat fibres.

6. *Why do some trees have rough barks and others smooth ones?*—Show the beech and poplar specimens. When the growth of the bark keeps pace with the growth of the woody cylinder the bark is smooth, but when the cylinder of wood increases at a greater rate than the surrounding cylinder of bark the latter ruptures, and is filled up in places with some secondary products, like *cork*. Children should be asked to notice the barks of various trees, and to make a list of those that are smooth and those that are rough.

Note.—Young trees of all kinds usually have smooth barks.

7. *The functions of wood and bast.*—The *wood* conducts the water absorbed by the roots. A willow shoot must be cut, and somewhere about the middle of it a



Section of Pine.
Showing annual rings and their effect in producing a certain kind of graining. The section is tangential.

ring of bark (say half an inch) be removed. The ringed shoot is then placed in water, which must not cover the ringed part. The leaves above the ringed portion will be found to keep quite fresh and to continue their growth. It is therefore apparent that the water must pass through the wood.

The *bast* conducts the food products manufactured by the leaves. Experiments are not very easily made to illustrate this. If from a young sapling tree a large ring of bark be removed, it will gradually die, as the food products manufactured by the leaves fail to reach the root.

8. *Why do hollow trees continue to send out shoots that bear leaves?*—A simple consideration of paragraph 5 (ii.) will show that in a tree the *oldest wood* must be pushed to the centre; but the *oldest bast* must be pushed towards the circumference. The old wood in the centre has ceased to conduct the water from the root, its cells are often filled up with other substances, and its chief function is to act as a support to the great tree. This old wood, often called "heart wood," is valuable to the carpenter. It is frequently much darker coloured—for example, oak and elm. Being, however, a dead substance, it rapidly falls a prey to fungus and other attacks, so that if a little water percolates into the tree and fungus germs are carried in, decay rapidly sets in, the wood rots away, and the tree soon becomes hollow. The younger wood, however ("sap wood"), being alive, resists the attack better, and is able to conduct water in quantity sufficient to supply the needs of the plant, which thus is able to continue its growth (see diagram).

9. *Annual rings.*—The larch specimen will show these well. These rings depend upon the fact that the wood made by a tree in spring differs in many ways from the wood made later in the year. In the spring wood the cells are generally larger, and the vessels larger; but the autumnal wood has smaller cells and often darker coloured walls. During the winter the tree rests entirely, so that there is always a very strong contrast between the last autumn wood and the fresh spring wood made in the following year, and this contrast produces the effect of the ring (see diagram).

(*To be continued.*)

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Both heels and toes may be made of *double* material, when care must be exercised to see that all *three* thicknesses are sewn together,

All cut-off parts of stockings not required for immediate use can be laid aside in a drawer or bag. The parts between the heels and toes are worthy of care when they have been woven *double*. The stockingette to be used must be smooth; if necessary, iron it. It should lie naturally, and not be stretched. As sewing silk keeps its colour in washing better than cotton, it is advisable to use it; but whatever is adopted must be the colour of the stocking.

Method of Working.—Pin the raw edges together on the *wrong* side, the right sides being facing each other. Tack them. Seam the edges closely, but not *tightly*, or the join will not press flat.

Work a few stitches backwards for commencing, joining, and fastening off. Make the stitches deep enough to hold the join together.

Use a short needleful of cotton, as a long one is apt to knot and drag the loops. Press the join quite flat with a hot iron.

Herringbone loosely *across* the seam, taking both the upper and lower parts of the stitches *beyond* the seam on each side. Commence, join, and finish off by darning the needle in and out for about an inch.

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To make a New Heel.—Cut off the old one so as to take in the thin, worn part (Fig. 1). Lay this on a fold

FIG. 1.—Dotted lines show how to cut off the heel and toe.

FIG. 2.

of the stockingette, taking care that the weave runs the same way. The *fold*, however, is not absolutely necessary, but it avoids a seam.

Cut the lower part of the heel to shape. Join the shaped part as described above, commencing at the outer edges, and working towards the corner (Fig. 2).

Turn the stocking wrong side out. Turn the heel *right* side out, placing a pin in the middle of the back. Slip the heel inside the stocking, so that the pin comes to the seam at the back of the leg.

Pin them together at that place. Put a pin into the middle of the bottom of the heel (the end of the seam), and pin it to the middle of the foot (Fig. 3). Tack, seam, press, and herringbone.

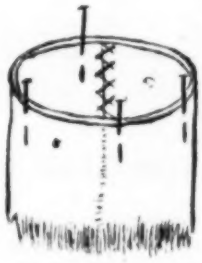

FIG. 3.

FIG. 4.

To make a New Toe.—Cut the toe off the old stocking (Fig. 1). Lay it on *double* stockingette, and shape it exactly.

Join the semicircular edges (Fig. 4). Turn the new toe right side out. Turn the stocking *wrong* side out, letting the foot lie flat, the seams coming to the right and left.

Slip the toe inside, placing the seams to those of the foot.

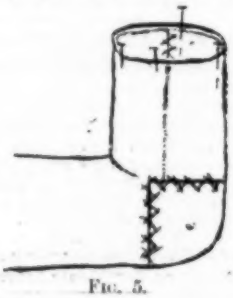

FIG. 5.

Pin them together in that position (Fig. 5). Pin the two also in the middle. Join in the usual way.

To make a New Foot.—Cut off the heel and underfoot along the seam which is represented by a dotted line in Fig. 6. Cut off the toecap *only* from the upper part (Fig 6).

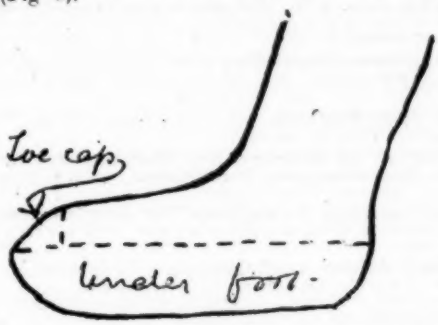

FIG. 6.

Join the toe to the *new foot* (Fig. 7). Join the back of the heel. Pin the new foot to the leg at the heel and toe. Fig. 6 shows the position of the parts. Complete as usual.

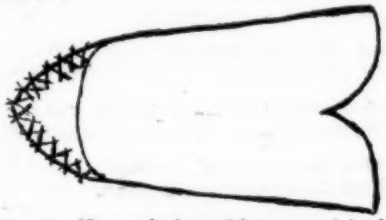

FIG. 7.—New underfoot with toe caps joined —heel seam not worked.

If the instructions are followed, the seams will lie quite flat. They should be well ironed for a time or two when the stockings are washed. The hose *look* as good as new, and are at the same time perfectly comfortable.

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NOTES FROM THE NORTH.

BY ROBERT DICKSON, M.A., F.E.I.S.

THE Institute has been giving the greater part of its attention during recent weeks to the question of superannuation. As is doubtless well known to our readers, the Scottish Education Act of 1908 does not definitely unfold the proposals for superannuation. These have been left to a later date. It is hoped that they will be published in the beginning of next session. There are one or two very important points that require the careful attention of the Superannuation Committee of the Institute. Already that Committee has issued a circular of queries to all the lady teachers of the Institute, asking what age they favour for retiral. The replies to these circulars have been received, and will, no doubt, be considered at an early date by the Superannuation Committee and the Institute. As the result of these inquiries it is probable that some definite plan of action will be determined upon so that the opinion of the Institute may be brought before the proper quarters. The Act has done great good to those teachers who had already retired—the Old Guard. In many cases their pensions have been nearly doubled, and in almost every case a gratifying increase has been secured. Many teachers are very anxious to know what will become of their contributions to the former fund, or, rather, to the fund that is still in operation. It is thought that the easiest plan will be to return all these contributions. Some favour the buying of an annuity with them. Whatever plan is adopted, there will still be a large amount to be handed over to form a nucleus for the new fund.

The Institute's Work.

IT was thought that the provision of the new Act dealing with the question of dismissals would reduce cases of hardship to a minimum. As yet that consummation has not been realised. There are still a number of cases occupying the attention of the Committee of the Institute appointed for that purpose. We have not yet had to call in the Education Department as arbiter in any case; but to those who take an interest in the matter it appears that ere long a first case will have to be submitted. It is highly important that when this case does occur it should be a strong one. It would do the Institute and the teaching profession much harm if it were otherwise, and we as teachers must be most circumspect in our action in view of this feeling. Boards, too, on whom to a large extent will fall the onus of responsibility in the matter, will, we feel certain, think twice before they act, as financially at least they will feel the effect of any mistake they make. No one wishes to see teachers morally or intellectually incapable kept in their positions, to the great injury of the pupils of the district; but when the cause of change is only one of petty local jealousy, then everything must be done to defend the character of the teacher, and at the same time bring home to Boards who cause dismissals for this reason that education is, after all, more than local, and that a teacher's reputation cannot be made the sport of local feeling.

Emergency Cases.

THE question of large classes is one of great importance at the present time. The Institute has been collecting statistics with regard to the size of classes, and we are amazed to find that even yet in Scotland large classes exist to a very great degree. The Code allows a teacher to be responsible for 60 pupils, but in a large number of schools classes of over 60 pupils are quite numerous. We find classes ranging from 90 to 61 in quite a great proportion of schools. Of course there are some schools in which the classes are rigidly kept at or below 60; but we find in schools, for example, 14, 19, 20, 17 classes ranging from 90 to 61. It is generally felt that in such classes education in its true sense is impossible. In almost none of the schools are classes of 40 found. The Institute some time ago suggested that the ideal number of pupils for any teacher was 40; but we feel certain that many members of the Council will open their eyes when they see how few of the schools of Scotland have classes of that number. It is thought that the Department should now make a forward step in the question of staffing. Teachers have not sought to press the matter too quickly, as for some time the profession was face to face with a great dearth of entrants. The new system of training has, however, to some extent remedied this matter, and it is now felt that as the supply of teachers is on the increase, there is now no reasonable excuse for the Department delaying the improvement so essential to the best interests of education. Whether they will do this when the new Code sees the light or not is a matter on which many different opinions are being expressed. The obsession of the rates is, perhaps, too powerful for them.

Large Classes.

THIS subject has been occupying the attention of the Rural Teachers' Committee, and as it was impossible to make any progress in the matter without definite data, the Council of the Institute gave instructions that circulars should be sent all over Scotland to find out the actual state of affairs. The result of the investigation conclusively proves, if proof were needed, that very little progress in this matter has been made during the last ten years. The salaries of class teachers have advanced to some extent, in large measure due to the lack of supply. But while it was difficult for School Boards to get answers to advertisements for class teachers, no such difficulty was experienced with regard to headmasterships of small schools. The attraction of a free house and garden, even if it were accompanied by a salary hardly equal to that paid to an ordinary class master in a city school, seemed to prove too much for many young men. Perhaps they had happy visions of a home to be shared soon by some one. At all events the state of matters is in all respects unsatisfactory. The salaries of rural teachers vary, according to the statistics now published, from £55 a year to £170. How the teacher can maintain his position and provide himself with the books necessary to keep himself up-to-date in education on the princely salary of £55 a year is a wonder. But perhaps we city teachers have not learned that noble art of self-denial. If we take the salary of an ordinary assistant in Edinburgh—£160 a year—we find that out of 536 returns only 54 teachers in country schools enjoy a better salary than the teacher in the metropolis, who has charge of only one class; while in many a country school the head teacher is responsible for all the classes above the infant department.

Salaries of Rural Teachers.

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Bosworth.—Find the area included between one of the branches of the curve $x^2y^2 = a^2(x^2 + y^2)$ and its asymptotes.

The asymptotes are parallel to the axes since x and y are the factors of the term of highest degree. Their equations (obtained from coefficients of the highest power of x and y) are

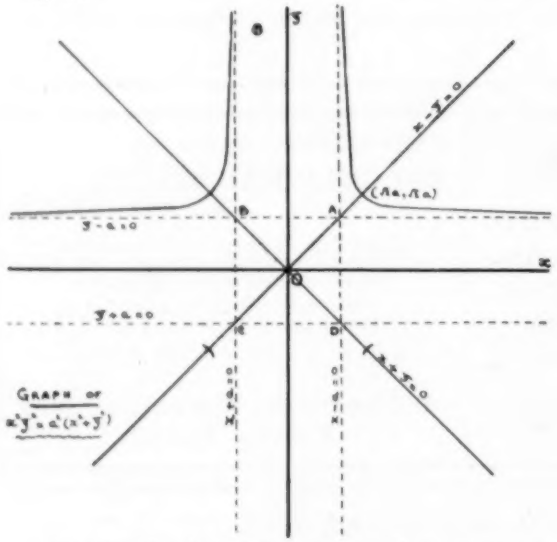
$$x + a = 0,\ x - a = 0,\ y + a = 0,\ y - a = 0.$$

The equation contains only even powers of x and y, consequently the co-ordinate axes are axes of symmetry; further, x^2 and y^2 can be interchanged without altering the equation, hence $x - y = 0$ and $x + y = 0$ are also axes of symmetry.

Writing the equation in the form

$$y^2 = \frac{a^2x^2}{x^2 - a^2},$$

we see that if y is real x must be numerically greater than a—that is, no real part of the curve exists inside the square ABCD. The origin lies on the curve, and is a conjugate point.



Put $x^2 = y^2$ and we find $x = y = \pm\sqrt{2}.a$. The points $\{\pm\sqrt{2}a, \pm\sqrt{2}a\}$ are those in which the curve meets the lines of symmetry. The curve consists of four branches, two of which are shown in the figure. The area between the branch in the first quadrant and the asymptotes $x = a$, $y = a$ is

$$= \int_a^\infty (y - a)dx$$

$$= \int_a^\infty \left\{\frac{ax}{\sqrt{x^2 - a^2}} - a\right\}dx$$

$$= a\Big[\sqrt{x^2 - a^2} - x\Big]_a^\infty.$$

Here, corresponding to the limit $x = \infty$, we have the indeterminate quantity $\infty - \infty$. This corresponds to the difference between the infinite area included between the curve and $y = 0$, and the infinite area included between the asymptote $y = a$ and the axis $y = 0$. To avoid this put $x = a$ cosec θ in the original integral;

$$dx = -\,a \operatorname{cosec}\theta \,.\, \cot\theta \,.\, d\theta.$$

Hence the area

$$= -\int_{\frac{\pi}{2}}^{0} \left\{\frac{a^2 \operatorname{cosec}\theta}{a\cot\theta} - a\right\} . a \operatorname{cosec}\theta \,.\, \cot\theta \,.\, d\theta$$

$$= a^2\int_0^{\frac{\pi}{2}} \frac{1 - \cos\theta}{\sin^3\theta}d\theta = a^2\int_0^{\frac{\pi}{2}} \frac{d\theta}{1 + \cos\theta} = \frac{a^2}{2}\int_0^{\frac{\pi}{2}} \frac{d\theta}{\cos^2\frac{\theta}{2}}$$

$$= a^2\Big[\tan\frac{\theta}{2}\Big]_0^{\frac{\pi}{2}} = a^2.$$

Spes.—(*a*) If the resultant of two forces is equal to their arithmetic mean, prove that their lines of action are inclined at an angle which is greater than 120°.

(*b*) If two forces are inclined first at an angle of 60°, and afterwards at an angle of 120°, the ratio of the two resultants obtained is $\sqrt{7} : \sqrt{3}$. Find the ratio of the forces.

(*a*) Let P, Q be the magnitudes of the two forces, θ the angle between their directions, both acting from or to their point of intersection. Then

$$\left(\frac{P + Q}{2}\right)^2 = P^2 + Q^2 + 2PQ\cos\theta,$$

hence

$$\cos\theta = -\frac{3P^2 + 3Q^2 - 2PQ}{8PQ}$$

$$= -\frac{(P - Q)^2 + 2P^2 + 2Q^2}{8PQ}$$

$$= -\left\{\frac{1}{4} + \frac{3(P - Q)^2}{8PQ}\right\}.$$

Hence since $(P - Q)^2$ is necessarily positive, $\cos\theta$ is negative and numerically greater than $\cos 120^\circ$ $(= \frac{1}{2})$—that is, θ is $> 120^\circ$.

(*b*) Let P and Q be the forces, using the usual formula

$$R^2 = P^2 + Q^2 + 2PQ\cos\theta$$

for the magnitude of the resultant.

$$\frac{P^2 + Q^2 + PQ}{P^2 + Q^2 - PQ} = \frac{7}{3}.$$

$$\therefore \frac{P^2 + Q^2}{PQ} = \frac{10}{4} = \frac{5}{2}.$$

$$\therefore 2P^2 - 5PQ + 2Q^2 = 0.$$

$$\therefore (2P - Q)(P - 2Q) = 0.$$

Hence $P : Q = 2 : 1$, or $1 : 2$.

George Pollock.—A circle of radius a rolls uniformly on the inside of a circle of radius b. Find expressions for the velocity and acceleration of any point on the circumference of the rolling circle. Examine the case when $b = 2a$.

Let the point on the moving circle whose motion we have to examine start from the point A (see Fig. 1) on the large circle (centre O), and suppose the small circle to have rolled into the position shown in the figure, P being the moving point.

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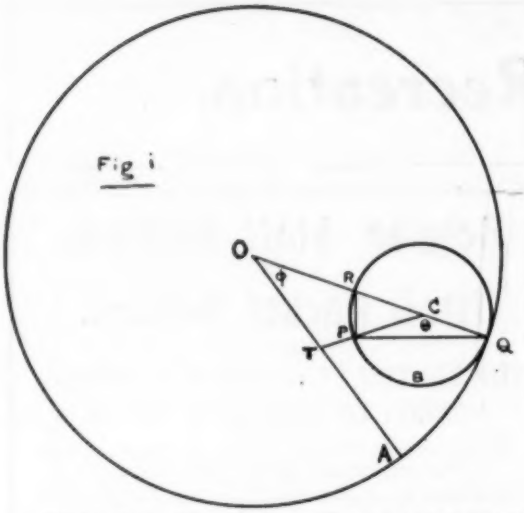


C being the centre of the moving circle, let CP meet the fixed radius OA in the point T. Let the angle AOC = ϕ and the angle PCQ = θ. Now since the small circle rolls on the large, the arc QBP must be equal to the arc AQ. This gives us the equation

$$a\theta = b\phi. \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (i)$$

The circle rolls *uniformly*, hence the centre C describes about O a circle of radius $(b - a)$ with uniform velocity. Let the angular velocity of C about O—that is, the rate of change of ϕ—be w. Thus the velocity of C relative to O is $(b - a)w$ perpendicular to OC, and the acceleration of C relative to O is $(b - a)w^2$ along CO.

Now the angle CTO is $(\theta - \phi)$, and this by (i) is $\frac{b-a}{a} . \phi$. But the angular velocity of the line CT in the plane is the rate of change of the angle CTO which it makes with the *fixed* line OA—that is, the angular velocity of CT is the rate of change of $\frac{b-a}{a} . \phi = \frac{b-a}{a} \times$ rate of change of ϕ—that is, $= \frac{b-a}{a} . w$.

But CP is fixed in length—that is, P relative to C moves in a circle; hence the velocity of P *relative* to C is $a . \frac{b-a}{a} w$, or $(b - a)w$ perpendicular to PC. Also the acceleration of P relative to C is $a . \left(\frac{b-a}{a}\right)^2 . w^2 = \frac{(b-a)^2 w^2}{a}$ along PC.

We can now find the actual velocity and acceleration of P in the plane, for since O is a fixed point the velocity of P is compounded of the velocity of P relative to C, and the velocity of C relative to O. Hence the velocity of P is the resultant of $(b - a)w$ perpendicular to PC and $(b - a)w$ perpendicular to OC. Since these are equal and respectively perpendicular to the equal sides of the triangle PCQ taken in order (note the sense of the directions of the two velocities), their resultant is perpendicular and proportional to the third side PQ—that is, the resultant velocity is

$$2(b - a) \sin \frac{\theta}{2} . w$$

in the direction PR.

This can also be found by noting that Q is the instantaneous centre of rotation, and consequently at the moment P is moving in a circle about Q, PQ is the normal and PR the tangent to the path of P.

We can find the acceleration of P in the same way by compounding P's acceleration relative to C with C's acceleration relative to O. Hence the acceleration of P is the resultant of

$$(a) \ \frac{(b-a)^2}{a} . w^2 \text{ along PC.}$$

$$(b) \ (b - a) . w^2 \text{ along CO.}$$

The resultant of these is $[R^2 = P^2 + Q^2 + 2PQ \cos \alpha]$

$$= \left(\frac{b-a}{a}\right) . w^2 . \sqrt{\{(b-a)^2 + a^2 + 2a(b-a)\cos\theta\}}$$

$$= \left(\frac{b-a}{a}\right) w^2 . \text{OP},$$

and makes an angle equal to POC with PC.

In the case when $b = 2a$ the small circle always passes through the centre O of the large circle (see Fig. 2). Let OA meet the small circle on P, and join CP. Since CP = CO we have $\angle$COP = $\angle$CPO, hence $\angle$PCQ = $\angle$2POQ—that is, the arc PQ $= a . \theta$

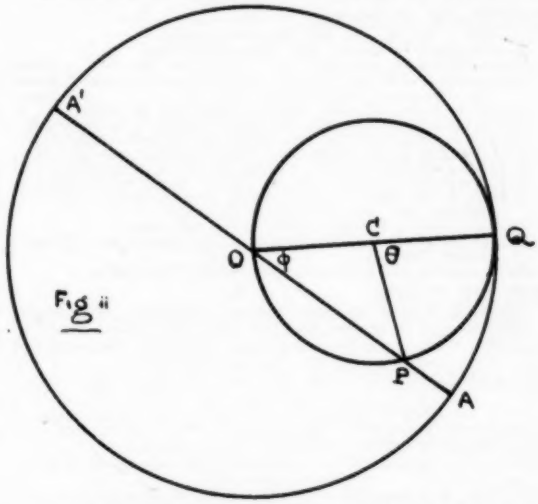
$$= \frac{b}{2} . \theta$$

$$= b . \frac{\theta}{2}$$

$$= b . \phi = \text{AQ},$$

or P is the moving point. Hence the moving point always lies on the line OA. We see that OA is perpendicular to PQ, Q being the instantaneous centre of rotation. The velocity of P, which is along AO, agrees in direction with the general case and its magnitude—that is, $2a \sin \frac{\theta}{2} . w$; that is, w . PQ.

Since the angle CPO is equal to the angle COP, the acceleration of P, which is obviously along AO, agrees in direction with the general case. The two components of



the acceleration along PC and CO (see (a) and (b) above) are now equal—namely, aw^2, and therefore proportional to the sides PC, CO of the triangle PCO, hence OP . w^2 represents the acceleration of P as before. Since the acceleration is proportional to P's distance from O, P moves with simple harmonic motion, O is the centre of oscillation, AA' is the amplitude, and $\frac{2\pi}{w}$ the period.

Mair (Singapore).—If $a^2(b + c) + b^2(c + a) + c^2(a + b) = \frac{4}{3}(a + b + c)^3$, prove that one of the three quantities a, b, c is an arithmetic mean between the other two.

(Straits Settlements Queen's Scholarship, 1909.)

The expression

$$2(a + b + c)^3 - 9a^2(b + c) - 9b^2(c + a) - 9c^2(a + b)$$

has factors $(2a - b - c)$ $(2b - c - a)$ $(2c - a - b)$, as the question suggests; these can be quite easily obtained by any of the ordinary methods. The work arranges itself rather neatly thus—

Let $a + b + c \equiv s$, then the expression can be written thus—

$$9a^2(b + c) + 9b^2(c + a) + 9c^2(a + b) - 2(a + b + c)^3$$
$$= 9a(ab + ca) + 9b(bc + ab) + 9c(ca + bc) - 2s^3$$
$$= 9a(ab + bc + ca) + 9b(bc + ca + ab) + 9c(ab + bc + ca) - 3s^3 + s^3 - 27abc$$
$$= s^3 - 3s^2(a + b + c) + 9s(ab + bc + ca) - 27abc$$
$$= (s - 3a)(s - 3b)(s - 3c).$$

Hence $(s - 3a)(s - 3b)(s - 3c) = 0$;

that is, $s - 3a = 0$, or $s - 3b = 0$, or $s - 3c = 0$;

that is, $a = \frac{1}{2}(b + c)$, or $b = \frac{1}{2}(c + a)$, or $c = \frac{1}{2}(a + b)$.

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COUPON
PRACTICAL TEACHER
July 1909

PRINTED AND PUBLISHED BY THOMAS NELSON & SONS, PROPRIETORS, AT THE OFFICE OF "THE PRACTICAL TEACHER," 35 & 36 PATERNOSTER ROW, LONDON, E.C.